

Inventory and Assessment for Rule Authorization of Underground Injection Control Facility
Quil Ceda Village Treated Effluent Infiltration System

APPENDIX A

Summary of Geotechnical Studies

**SUMMARY OF GEOTECHNICAL STUDIES
EFFLUENT INFILTRATION PROJECT
TULALIP, WASHINGTON**

Submitted to:

Tulalip Tribe c/o
Parametrix, Inc.
PO Box 460
Sumner, Washington 98390-1516

Submitted by:

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March 15, 2002

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March 15, 2002
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Tulalip Tribe c/o
Parametrix, Inc.
PO Box 460
Sumner, Washington 98390-1516

Attention: Mr. Ken Fellows

Subject: Geotechnical Investigation Report
Effluent Infiltration Project
Tulalip, Washington

Dear Ken:

AMEC Earth & Environmental, Inc. (AMEC) is pleased to submit this report describing our geotechnical investigation of the above-referenced project site. The purpose of our study was to gain an understanding of the infiltration characteristics of the site.

Authorization to perform these services was provided in your Subconsultant Agreement for Parametrix Project No. 216-1598-012, signed by us on November 26, 2001. This report has been prepared for the exclusive use of Tulalip Tribe and their consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice.

We appreciate the opportunity to be of service on this project and would be happy to answer any questions you may have.

Sincerely,
AMEC Earth & Environmental, Inc.

James S. Dransfield, PE
Principal Engineer

TMM/TDW/JSD/clt
Distribution: Mr. Ken Fellows, Parametrix, Inc. (7)

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**SUMMARY OF GEOTECHNICAL STUDIES
EFFLUENT INFILTRATION PROJECT
TULALIP, WASHINGTON**

1-91M-13845-A

1.0 SUMMARY

The following summary of project geotechnical considerations is presented for introductory purposes and, as such, should be used only in conjunction with the full text of this report.

- **Project Description:** The plan for the infiltration facilities calls for a linear gravel-filled trench, approximately 4,750 feet in total length, located in the narrow strip of land between Interstate 5 and Quil Ceda Boulevard.
- **Exploratory Methods:** We explored subsurface conditions by means of nine borings, 42 test pits, 7 observation wells, 9 single piezometers, and 19 nested piezometers advanced at strategic locations across the project site. We also performed 8 cone penetrometer tests (CPTs) along the proposed infiltration trench alignment.
- **Soil Conditions:** According to published geologic maps, soil conditions in the site vicinity are characterized by well-drained, stratified to massive outwash sand with fine gravel, and some beds of silt and clay. These sediments, known as the Marysville Sand Member, were deposited by meltwater flowing south from the stagnating and receding Vashon glacier.

Our on-site explorations revealed somewhat variable near-surface soil conditions but confirmed the mapped stratigraphy. In general, our explorations encountered fine, fine to medium, and fine to coarse sands with trace to some silt, and silty sands with some interbeds of sandy silt and clayey silt. The fine-grained soil horizons appear to be scattered and discontinuous within the subsurface profiles, and distinct layers could not be identified from our observations. The enclosed exploration logs provide a detailed description of the soil strata encountered in our subsurface explorations.

- **Groundwater Conditions:** Across the site, groundwater was encountered at 1½ to 20 feet below the ground surface. Specifically along the proposed infiltration trench alignment, the groundwater surface varied from 14 to 20 feet below the ground surface.
- **Confirmatory CPT Probing:** The CPT probing confirms that soil and groundwater conditions at the proposed infiltration trench alignment are consistent with more detailed measurements and testing conducted on nearby portions of the site.

2.0 SITE AND PROJECT DESCRIPTION

The project site is generally located in the Tulalip Office Park area of the Tulalip Indian Reservation, Washington, as shown on the enclosed *Location Map* (Figure 1). Site boundaries are generally delineated by 88th Street N.E. on the south, by Quil Ceda Boulevard on the east, by 116th Street NE on the north, and by open space on the west.

3.0 EXPLORATORY METHODS

We explored surface and subsurface conditions at the project site during November of 2001 through February of 2002. Our exploration and testing program comprised the following elements:

- A visual surface reconnaissance of the site;
- Nine borings (designated B-1 through B-9) with Standard Penetration Tests, advanced at strategic locations across the site;
- Seven groundwater observation wells (designated OW-1 through OW-7), installed in or near all of our boreholes;
- Nine piezometers/wells (designated P-1 through P-9) installed at strategic locations across the site;
- Nineteen nested piezometers (designated I-1/S-1 through I-1/S-3, I-1/E-1 through I-1/E-3, I-2/S-1 through I-2/S-3, I-2/E-1 through I-2/E-3, I-3/S-1 through I-3/S-3, and I-3/W-1 through I-3/W-2, and I-4/S-1 through I-4/S-2) were installed near infiltration test pits (designated I-1 through I-4) performed by others;
- Forty-four backhoe test pits (designated TP-1 through TP-23, including FTP-19A through FTP-19I, and TP-101 through TP-112), five with installed piezometers and 39 without, excavated at strategic locations across the site;
- Twenty-nine grain size analyses, performed on selected soil samples obtained from the nine borings (B-1 through B-9), from the test pits for the casino dewatering project (TP-101 through TP-112), and from the bottoms of the infiltration test pits (I-1 through I-4);
- Eight cone penetrometer tests (CPTs) performed at selected locations along the proposed infiltration trench alignment;
- A review of published geologic maps and literature.

A timeline and description of the exploration program is provided below.

October 31, 2001:

Five of the forty-four test pits were excavated on October 31, 2001, in order to obtain a general sense of groundwater and soil conditions across the site. The test pit locations were determined by Parametrix and were excavated and backfilled using a rubber tire backhoe operated by a Tulalip Tribe contractor. A piezometer with 5 feet of hand slotted screen was installed within each of these test pits.

November 5-13, 2001:

During November 5-13, 2001, seven of the borings (B-1 through B-7) were drilled to depths of 46.5 to 51.5 feet below the ground surface using the services of Environmental Drilling Company. Borings B-1 and B-2 were advanced using hollow-stem auger equipment and adding water to stabilize the hole. Since stabilization was difficult to obtain using water, borings B-3 through B-7 were advanced using hollow-stem auger and a bentonite slurry to stabilize the holes. Standard penetration test (SPT) samplers were driven nearly continuously, and the samples were collected and transported to AMEC's laboratory for soil type identification and testing purposes. The borings were logged by a geotechnical engineer. For borings B-1 and B-2, a 20-foot well with 10 feet of bottom screen was installed within each boring. For borings B-3 through B-7, a separate 20-foot well with 10 feet of bottom screen was drilled and installed within 15 feet of each of the borings. A detail of the well construction is shown for each well on the enclosed logs.

November 7-14, 2001:

During November 7-14, 2001, nine, 20-foot single piezometers/wells (P-1 through P-9) with 10 feet of bottom screen were installed at locations selected by Parametrix across the project site. Geo-Tech Explorations, Inc., installed the nine piezometers, which were observed and logged by an AMEC geologist from the soil cuttings. Samples were not taken, and SPT's were not performed with the exception of Piezometer P-9 within the proposed wastewater treatment plant site. Well construction details are shown on the enclosed logs.

Nineteen nested piezometers were also installed at this time at locations identified by Parametrix. These wells were installed on the downgradient, south and east sides of the infiltration tests (I-1 through I-4), to measure groundwater mounding. These wells are designated I-1/S-1 through I-1/S-3, I-1/E-1 through I-1/E-3, I-2/S-1 through I-2/S-3, I-2/E-1 through I-2/E-3, I-3/S-1 through I-3/S-3, and I-3/W-1 through I-3/W-2, and I-4/S-1 through I-4/S-2. Geo-Tech Explorations, Inc., installed the nineteen, nested piezometers, and they were logged from the soil cuttings by an AMEC geologist. No samples were taken or SPT's

performed during drilling. The nested piezometers consisted of two, 1-inch diameter piezometers, one 22 feet in length and the other 35 feet long. Each piezometer had two feet of screen at the bottom. A bentonite seal was placed between the upper and lower screened sections of the nested piezometers. Construction details of the nested piezometers are shown on the enclosed well logs.

November 27-29, 2001:

During November 27-28, 2001, twenty-seven of the forty-four test pits were excavated at selected locations across the site. Fourteen of these (test pits TP-15 through TP-19I) were located by AMEC for design purposes at the proposed site for the wastewater treatment plant. The remaining nine test pit locations (test pits TP-6 through TP-14 and TP-20 through TP-23) were determined by Parametrix. All of the test pits were logged by an AMEC geologist and excavated using a rubber tire backhoe operated by a subcontractor obtained by the Tulalip Tribe.

December 7, 2001:

On December 7, 2001, borings B-8 and B-9 were drilled to depths of 39 feet at selected locations at the proposed location for the wastewater treatment plant. Borings B-8 and B-9 were advanced using hollow-stem auger and a bentonite slurry to stabilize the holes. Standard penetration test (SPT) samplers were driven every 2 ½ to 5 feet, and the samples were collected and transported to AMEC's laboratory for soil type identification and testing purposes. The borings were excavated by Holt Drilling Company and logged by an AMEC geologist.

January 31, 2002:

On January 31, 2002, twelve additional test pits were excavated for a separate project (evaluating the feasibility of temporarily discharging pumped groundwater from the Tulalip Casino site). The test pits (TP-101 through TP-112) were excavated within two areas, one to the north and one to the south of the casino site. The test pits were logged by an AMEC geologist and excavated by Gobin Hauling & Excavating.

February 19, 2002:

On February 19, 2002, eight cone penetrometer tests (CPTs) were performed at selected locations along the proposed infiltration trench alignment. These tests were performed to confirm that there are no significant silt layers that would inhibit vertical infiltration and that the

groundwater table is sufficiently deep. Pore pressure dissipation tests were performed at each CPT location to determine the depth to groundwater. No soil samples were collected, but the soil types were correlated from tip and friction resistance and presented on the enclosed CPT logs.

The specific number, locations, and depths of our explorations, wells, and piezometers were either determined by AMEC, or selected by Parametrix and field-adjusted by AMEC, in relation to the existing and proposed site features, under the constraints of surface access, underground utility conflicts, and budget considerations.

It should be realized that the explorations performed and utilized for this evaluation reveal subsurface conditions only at discrete locations across the project site and that actual conditions in other locations could vary. Furthermore, the nature and extent of any such variations would not become evident until additional explorations are performed or until construction activities have begun. If significant variations are observed at that time, we may need to modify our conclusions and recommendations contained in this report to reflect the actual site conditions.

4.0 SITE CONDITIONS

The following sections of text present our observations, findings, and interpretations regarding soil and groundwater conditions at the project site.

4.1 General Soil Conditions

According to published geologic maps, soil conditions in the site vicinity are characterized by well-drained, stratified to massive outwash sand with fine gravel and some beds of silt and clay. These sediments, known as the Marysville Sand Member, were deposited by meltwater flowing south from the stagnating and receding Vashon glacier.

Our on-site explorations revealed somewhat variable near-surface soil conditions but confirmed the mapped stratigraphy. In general, our explorations encountered fine, fine to medium, and fine to coarse sands with trace to some silt and silty sands with some interbeds of sandy silt and clayey silt. The fine-grained soil horizons appear to be scattered and discontinuous within the subsurface profiles, and distinct layers could not be identified from our observations. The enclosed exploration logs provide a detailed description of the soil strata encountered in our subsurface explorations.

Our geotechnical laboratory tests revealed that the relatively clean, sands have a fines (silt and clay) content on the order of 4 to 9 percent. The silty sands appear to have a fines content ranging from 17 to 46 percent. Moisture contents ranged from 20 to 30 percent for the saturated soils, and moisture contents of about 5 to 10 percent were obtained for the unsaturated soils. The enclosed laboratory testing sheets graphically present our test results, and Table 1 lists these results.

TABLE 1
LABORATORY TEST RESULTS

Exploration Number	Sample Depth (feet)	Moisture Content (percent)	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)
B-1	28	20.4	7.3	85.8	6.9
B-1	47	20.2	4.9	57.6	37.5
B-2	17	21.4	0.9	90.2	8.9
B-2	37.5	25.3	0	82.9	17.1
B-3	7	9.5	1.1	91.5	7.4
B-3	44.5	21.1	0	78.4	21.6
B-4	12	29.6	0.8	57.8	41.4
B-4	37.5	24.0	0.1	92.3	7.6
B-5	19	24.5	7.8	88.1	4.1
B-5	37	25.0	0	94.0	6.0
B-6	14.5	24.7	6.6	89.4	4.0
B-6	23.5	24.5	1.4	94.6	4.0
B-7	11.5	22.8	0.8	90.8	8.4
B-7	47	25.5	0	53.8	46.2
B-8	22.5	25.8	0	90.6	9.4
B-9	5	26.4	0.2	94.9	4.9
I-1	3	14.3	0.4	95.3	4.3
I-2	3	10.6	0.1	93.5	6.4
I-3*	3	35.3	0	59.2	40.8
I-4	4	12.7	0.2	96.6	3.2
TP-101	2	7.0	2.1	95.0	2.9
TP-102	9	5.8	0	98.6	1.4
TP-103	5	6.4	3.6	95.6	0.8
TP-105	2	16.9	0.1	89.3	10.6
TP-106	4	6.1	7.1	91.7	1.2
TP-107	3	8.7	0.7	90.9	8.4
TP-108	4	8.0	0	96.1	3.9
TP-110	1	11.3	0	94.5	5.5
TP-112	8	5.6	4.5	94.1	1.4

* note- the bottom of I-3 was submerged and an alternate sample location near well P-7 was selected by Parametrix. This alternate sample is labeled as I-5 in the Appendix B lab results.

For the seven borings to 50 feet (B-1 through B-7), where nearly continuous sampling was performed, we found the intervals of clean sands, silty sands, and silts. We also summarized the continuous profiling of the eight Cone Penetrometer tests; this data is presented in Tables 2 and 3.

TABLE 2 SUMMARY OF SOIL LAYERS (Thickness in feet)				
Boring	Clean Sand	Silty Sand	Silts	Total
B-1	42	9.5	0.2	51.7
B-2	17.25	28.25	1.5	47
B-3	26.5	24	0.5	51
B-4	20.25	25.25	3.5	49
B-5	17	32.5	1	50.5
B-6	28.25	21	3.5	52.75
B-7	26.5	19.5	4.5	50.5
Totals	177.75	160	14.7	352.45

TABLE 2 (continued)				
Cone	Clean Sand	Silty Sand	Silts	Total
CPT-1001	23.8	2.8	1.8	28.4
CPT-1002	24.2	4.1	1.9	30.2
CPT-1003	20.5	7.0	1.3	28.8
CPT-1004	12.7	15.1	1.0	28.8
CPT-1005	17.8	7.1	3.3	28.2
CPT-1006	18.2	8.6	2.3	29.1
CPT-1007	11.2	15.1	1.8	28.1
CPT-1008	19.6	6.8	0.8	27.2
Totals	148.0	66.6	14.2	228.8

Table 3 presents the same data in terms of percentage by volume.

TABLE 3 SUMMARY OF SOIL LAYERS (Expressed as % by volume of total soil column)				
Boring	Clean Sand	Silty Sand	Silts	Total
B-1	81%	18%	0.4%	100%
B-2	37%	60%	3.2%	100%
B-3	52%	47%	1.0%	100%
B-4	41%	52%	7.1%	100%
B-5	34%	64%	2.0%	100%
B-6	54%	40%	6.6%	100%
B-7	52%	39%	8.9%	100%
Average	50.1%	45.7%	4.2%	100%

TABLE 3 (continued)				
Cone	Clean Sand	Silty Sand	Silts	Total
CPT-1001	83.8%	9.9%	6.3%	100%
CPT-1002	80.1%	13.6%	6.3%	100%
CPT-1003	71.2%	24.3%	4.5%	100%
CPT-1004	44.1%	52.4%	3.5%	100%
CPT-1005	63.1%	25.2%	11.7%	100%
CPT-1006	62.5%	29.6%	7.9%	100%
CPT-1007	39.9%	53.7%	6.4%	100%
CPT-1008	72.1%	25.0%	2.9%	100%
Average	64.6%	29.2%	6.2%	100%

Four large scale infiltration tests were performed in proximity to four of our borings, and some test pits. A summary of this data is presented in Table 4 below.

TABLE 4 SUMMARY OF INFILTRATION TESTS WITH BORINGS, TEST PITS AND DEPTH TO GROUNDWATER INFORMATION				
Infiltration Test	Test Result	Nearby Boring	Nearby Test Pit(s)	Depth to Groundwater at Time of Drilling (ft)
I - 1	Pass	B - 1	TP-6, TP-8	18.9
I - 2	Pass	B - 3	TP-9	15.7
I - 3	Fail	B - 6	TP-13	4.5
I - 4	Fail	B - 7	TP-4	5.7

4.2 Soil Conditions Along Infiltration Trench Alignment

CPT data was also collected along the proposed alignment for the wastewater treatment plant's infiltration trench. The CPT logs and dissipation data are presented in Appendix A. Table 5 presents a summary of interpreted soil layers from these explorations. As can be seen from Tables 2 and 3, the percentages of the sand, silty sand and silt layers are similar (to more sandy) than the results of the seven borings. The CPT probing confirms that soil and groundwater conditions at the trench are consistent with soil classification, groundwater levels, and infiltration conditions measured nearby portions of the site.

TABLE 5
SUMMARY OF SOIL LAYERS FROM CPT RESULTS

Exploration Number	Depth to Sand/Silty Sand below Surficial Silts (feet)	Depth of Silt/Sandy Silt Interbeds (feet)	Depth of Gravelly Sand Interbeds (feet)	Depth to Groundwater (feet)
CPT-1001	1.7	0.7 to 1.7 19.0 to 19.8	21.6 to 22.4	20.2
CPT-1002	1.7	0.2 to 1.7	20.7 to 28.0	19.2
CPT-1003	0.5	0.1 to 0.5 4.6 to 5.3 26.9 to 27.0	16.5 to 17.4 18.5 to 20.5	18.6
CPT-1004	0.5	0.1 to 0.5 29.2 to 29.8	not encountered	15.3
CPT-1005	1.6	0.1 to 1.6 10.2 to 11.0 17.4 to 18.2 19.0 to 19.5	not encountered	14.3
CPT-1006	1.9	0.1 to 1.9 28.7 to 29.2	not encountered	15.9
CPT-1007	2.2	0.2 to 2.2	not encountered	17.7
CPT-1008	2.3	1.5 to 2.3 6.4 to 6.8	not encountered	16.5

4.3 Groundwater Conditions

At the time of drilling (November 5-13, 2001), our explorations encountered groundwater at depths ranging from 1½ to 18½ feet below existing grades. The groundwater levels have also been monitored within selected observation wells and piezometers. Since monitoring began, AMEC has observed that groundwater levels have risen as much as 3 feet during this time. Table 6, presented after the text of this report, summarizes the approximate groundwater depths measured in our explorations, observation wells, and piezometers.

On January 10, 2002, Parametrix requested that we take additional groundwater measurements from some wells previously installed by Landau Associates, Inc (TGW-17, TGW-24, and TGW-39). These measurements are also included within Table 6. (Updated tables containing further measurements of the groundwater table will be provided as the measurements are obtained.)

The CPT explorations along the proposed alignment for the 4,750-foot long infiltration trench, identified the groundwater table at 14.3 feet to 20.2 feet below the ground surface. Table 5, above, presents these results, and Table 7, following this report, presents the calculation worksheet.

Throughout the year, groundwater levels would likely fluctuate in response to changing precipitation patterns, off-site construction activities, and site utilization.

5.0 PUMP TESTING

A pump test was conducted on each of the 2-inch piezometer wells (well numbers P-1 through P-9) installed across the project site. Each pump test consisted of pumping from each of the wells utilizing an electric, submersible pump at a constant flow rate for a total of 15 minutes. The pump rate was kept constant throughout each test, at a rate such that the water table did not drop below the depth of the top of the screened portion of the well. One exception to this was at piezometer P-2, which had a static water level below the depth of the top of the screened interval. The pumping rate for the various wells varied from 1.1 gallons per minute (gpm) to 5.5 gpm. Drawdown was measured at regular intervals, by "hand-dipping" a water level indicator probe within the well. Upon completion of the 15-minute pumping period, the pump was shut off and recharge of the well was monitored for 5 minutes. It should be noted that for the tests conducted on P-1, P-2, P-3, and P-4, water "back flowed" from the pump/discharge lines into the well, thereby discharging additional water into the wells as they recovered. This problem was corrected for the remainder of the pump tests. The data collected for each of the pump tests is presented in Appendix C.

6.0 INTERPRETATION OF DATA

6.1 Infiltration Rate Correlations

On the basis of our collected data, we can make the following qualitative correlations with regards to infiltration rates:

- There appears to be some correlation based on the percentage of silts within the 50-foot soil profiles of B-1 through B-7. Referring to Table 3 and Table 4, boring B-1 and B-3, near passing infiltration tests I-1 and I-2, had relatively low silt percentages overall (1 percent or less). Borings B-6 and B-7, however, were located near failing tests I-3 and I-4 and had 4.2 to 8.9 percent silts.
- There does not appear to be a correlation based on the percentage of silty sands. Again referring to Table 3 and Table 4, borings B-1 and B-3 had 18% and 47% silty sands, respectively. Borings B-6 and B-7 had 40% to 39% silty sands in their profiles, respectively.
- There is a good correlation based on depth to groundwater. As presented in Table 4, the depth to groundwater was significantly deeper at B-1 and B-3 (19.9 and 15.7 feet respectively). At the failed tests, the depth to water was shallow (4.5 to 5.7 feet).
- There appears to be a moderate to good correlation based on the presence of any interbeds of silty sand or silt. In review of the pertinent boring logs and test pit logs, boring B-1 had silty interbeds between 10.5 and 15.5 feet below the ground surface. Boring B-3 had silty interbeds at 5.5 feet, and from 13 feet to 15 feet. Boring B-6 had silty interbeds from 2.5 to 5 feet, and from 11.5 to 14.5 feet. Boring B-7 had silty interbeds from 1 to 2.5 feet, at 9.5 feet, at 13 to 15 feet, and at 18 feet. Referring to the shallower test pit logs, test pits TP-6, TP-8, and TP-9 did not encounter discrete silty sand or silt layers to the depths explored. Test pit TP-13 had encountered a silty sand layer from 2 to 3 feet, and again at 4.5 to 6 feet. Test pit TP-4 encountered a silty sand layer from 1 to 3 feet below the ground surface.
- There is insufficient data to establish a correlation based on grain size distribution. Grain size distribution testing was used to confirm the visual classification of the soils encountered in our borings and test pits. The grain size testing was performed on samples of each of the representative soil types; these samples were obtained from various depths. There is only limited correlation between soil gradation and the success or failure of infiltration tests I-1 through I-

4. The soil beneath passing tests I-1 and I-2 was a clean fine sand; while the soil beneath the failing test at I-3 was a silty fine sand. However, the soil at failing test I-4 was a clean medium sand (which would be expected to have a higher permeability than I-1 and I-2).

6.2 Vertical Infiltration Rate Analysis

For the analysis of vertical infiltration rates for the proposed infiltration trench, subsurface information, field test results, and laboratory test results were compiled from the following studies:

- AMEC's Tulalip Wastewater Facilities project;
- Parametrix's infiltration tests;
- AMEC's Tulalip Casino project;
- AMEC's Quil Ceda Blvd. project;
- Wert & Associates New Casino for the Tulalip Tribe project; and
- Tulalip Storm Water Design Manual.

Specific explorations and test results that were located near the proposed infiltration trench were selected from each of these studies. The explorations reviewed, available information such as soil descriptions and test results, and interpreted infiltration rates are displayed on Table 8 behind the text section of this report.

The available data was compiled and interpreted according to the following criteria:

1. **Location:** Explorations were selected that were located near the proposed infiltration trench. All of the selected explorations are within 800 feet of the proposed trench and most are within 300 feet.
2. **Depth to Groundwater:** The depth to groundwater was checked to make sure it was sufficiently deep to not adversely influence infiltration rates. All the explorations located near the proposed trench had sufficient depth to groundwater, estimated to be greater than 10 feet deep.
3. **Silt interbeds:** Most of the exploration logs did not indicate any silt interbeds. The few silt interbeds that were encountered were sufficiently deep so that infiltration rates are not likely to be affected.
4. **Grain size distribution:** The soil grain size descriptions were used to correlate infiltration rates. Laboratory test results were used with Hazen's formula to estimate an infiltration rate. These estimates were found to correlate well with the field infiltration test results, thus verifying the validity of Hazen's formula for this project. At locations where no testing was

done the grain size description could be used to estimate a rate from test results of similar soils.

5. Infiltration rates: Where field infiltration tests were not performed, a range of rates were estimated based on grain size correlation and interpolation from nearby field test results. The explorations were grouped by location and an average infiltration rate was interpreted for each group. We also included the suggested infiltration rate provided in the Tulalip Storm Water Design Manual. The final design infiltration rate was determined by averaging each group rate. In this way, the design rate is roughly an area-weighted and quality-of data-weighted average.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Project Understanding

The effluent infiltration trench will be 5 feet wide and 4 feet deep and be located 1 ft to the west of the I-5 west ROW fence. The total length of the trenches will be approximately 4,750 ft. The distribution pipes will run inside the trench. The trench will receive up to 250,000 gallons per day of wastewater (on an annual average basis). Infiltration will be accomplished in nineteen 250-foot long trench segments. Each segment will have a totalizing flow meter, manual throttling valve for flow control, and a float valve to shut off flow to the segment in the event of ponding effluent.

7.2 Feasibility of Infiltration Trenches

The operation of the proposed infiltration trenches appears to be feasible from a geotechnical standpoint as long as the trench depth is kept below the topsoil and surficial silty soils. We recommend a minimum depth to trench bottom of three feet. As it is understood that the trench is to be designed for a depth of 4 feet, this is not anticipated to be a problem.

7.3 Recommended Infiltration Rate

Based on the described interpretation of the available data, we recommend utilizing an un-factored, vertical infiltration rate of 33 inches per hour. This appears to be a reasonable and realistic rate of vertical infiltration that could be assumed along the entire length of the proposed trench. In our opinion, a factor of safety of 3 should be applied to this rate. This recommended safety factor is based on several considerations, as discussed below.

Subsurface Variability and Data Uncertainty: Previous subsurface investigations have identified variability in the sand soils beneath the site, with gradations ranging from fine sand to medium sand, with varying amounts of silt. These conditions will result in local variability in the infiltration rates.

The infiltration testing was performed by different firms at different times, using varying test depths and areas. A portion of the infiltration test variability may therefore be attributed to variations in the infiltration testing methods.

The Tulalip Storm Water Design Manual requires a safety factor of 2 for storm water infiltration. In our opinion, this should be the minimum safety factor since the manual is concerned with periodic infiltration of storm water, whereas this project requires continuous infiltration of treated wastewater. We recommend using a safety factor of 3, to account for data uncertainty and subsurface variability.

The design infiltration rate and safety factor should also be reviewed in light of the other factors discussed below.

Long term Clogging Potential: Long term clogging may occur due to physical, chemical and biological factors, as follows:

Physical – on this project, there appears a relatively low risk of clogging due to siltation. We understand the treated effluent will have very low turbidity (0.1 NTU, and non-detectable Total Suspended Solids). We understand the five-foot wide by four-foot deep trench section is to be backfilled with free-draining gravel media. We would suggest a relatively fine gravel backfill such as pea gravel, so that migration of fines from the surrounding native soils is minimized. A recommended gradation for the gravel backfill is provided within the next section.

Chemical – we understand that precipitation of metals or other compounds may occur, depending on the chemistry of the wastewater effluent. An example would be if the wastewater has high metals and high dissolved oxygen content. This was not part of our scope of investigation. We could research this topic further if needed.

Biological – we understand there is a potential for clogging if there are excessive nitrates in the the wastewater. It is our understanding that Wert & Associates is researching this topic.

Excessive Groundwater Mounding: Based on our review, separation between the bottom of the infiltration facility and the groundwater table is critical for operation of this facility. If groundwater mounding causes the water table to rise to the base of the infiltration facility, infiltration can only occur as fast as groundwater can move laterally away from the site. This may only be about 1 percent of the design infiltration rate.

It is our understanding that Pacific Groundwater Group is modeling the local groundwater table to determine the potential for mounding to adversely affect the infiltration trench facility.

7.4 Recommended Gradation of Trench Backfill

AMEC has identified two material types which we recommend for use as trench backfill. We selected this material gradation using graded soil filter criteria, to limit the migration of the native sand material back into the gravel fill, while providing a higher permeability than the surrounding native soil. We recommend either using a crushed rock material, such as WSDOT 9-03.8(6) Aggregate for Asphalt, Class A and B, or a coarse sand, such as WSDOT 9-03.13 Backfill for Sand Drains.

8.0 CLOSURE

The conclusions and recommendations presented in this report are based, in part, on the explorations that we performed and utilized for this study; therefore, if variations in the subgrade conditions are observed at a later time, we may need to modify this report to reflect those changes. Also, because the future performance and integrity of the project elements depend largely on proper initial site preparation, drainage, and construction procedures, monitoring and testing by experienced geotechnical personnel should be considered an integral part of the construction process. AMEC is available to provide geotechnical monitoring, soils testing, and other services throughout construction.

We appreciate the opportunity to be of service on this project. If you have any questions regarding this report or any aspects of the project, please feel free to contact our office.

Sincerely,

AMEC Earth & Environmental, Inc.

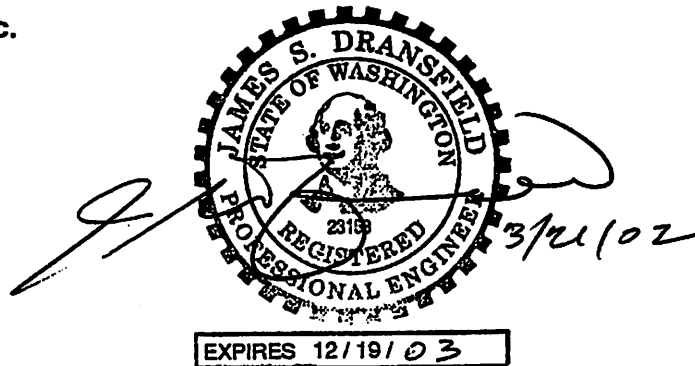


Tamara M. Miller
Senior Staff Engineer



Todd D. Wentworth, P.E., P.G.
Senior Geotechnical Engineer

TMM/TDW/JSD/clt



James S. Dransfield, P.E.
Principal

FIGURES AND TABLES



N.T.S.

amec









LOCATION MAP

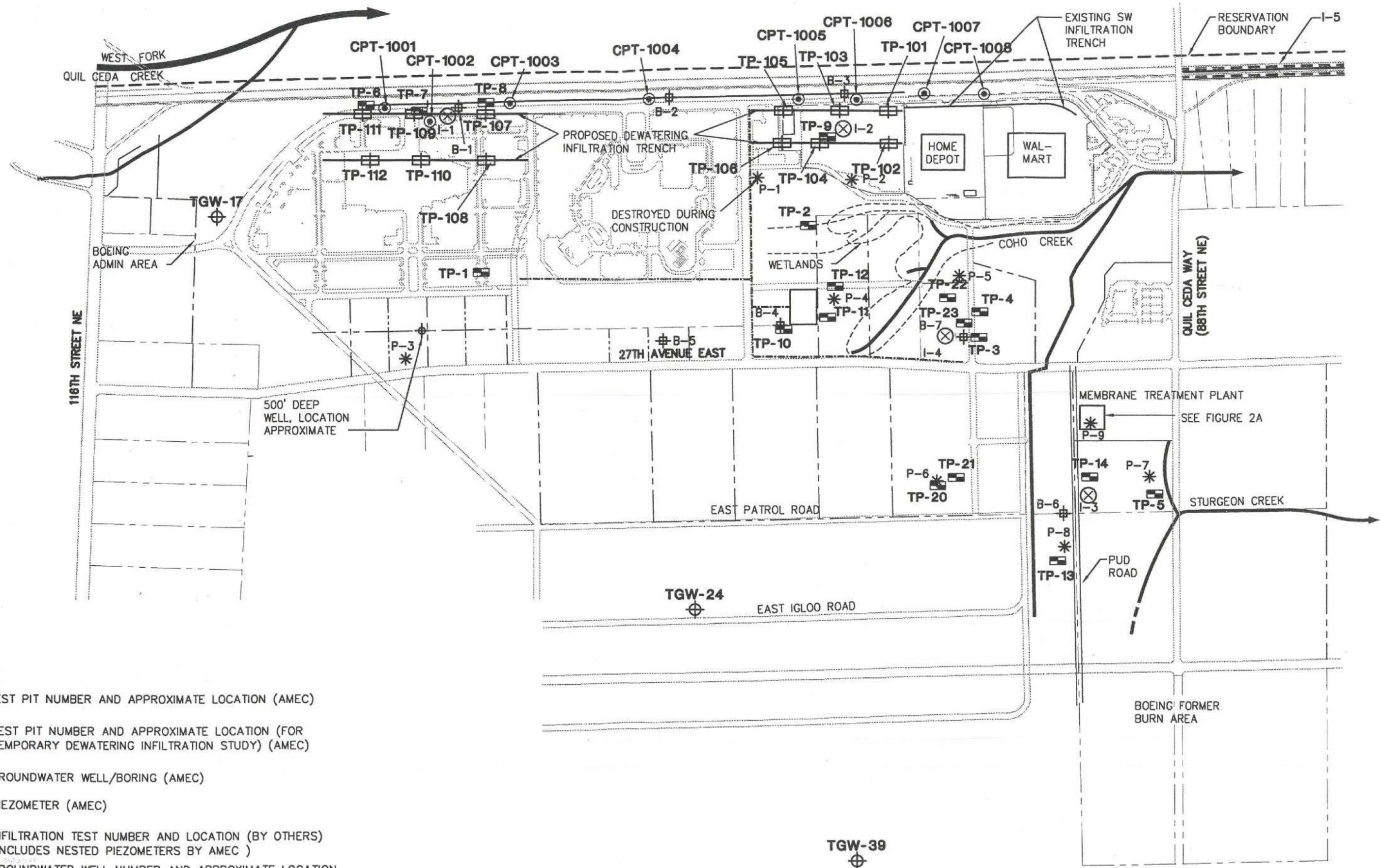
EFFLUENT INFILTRATION PROJECT

FIGURE

1

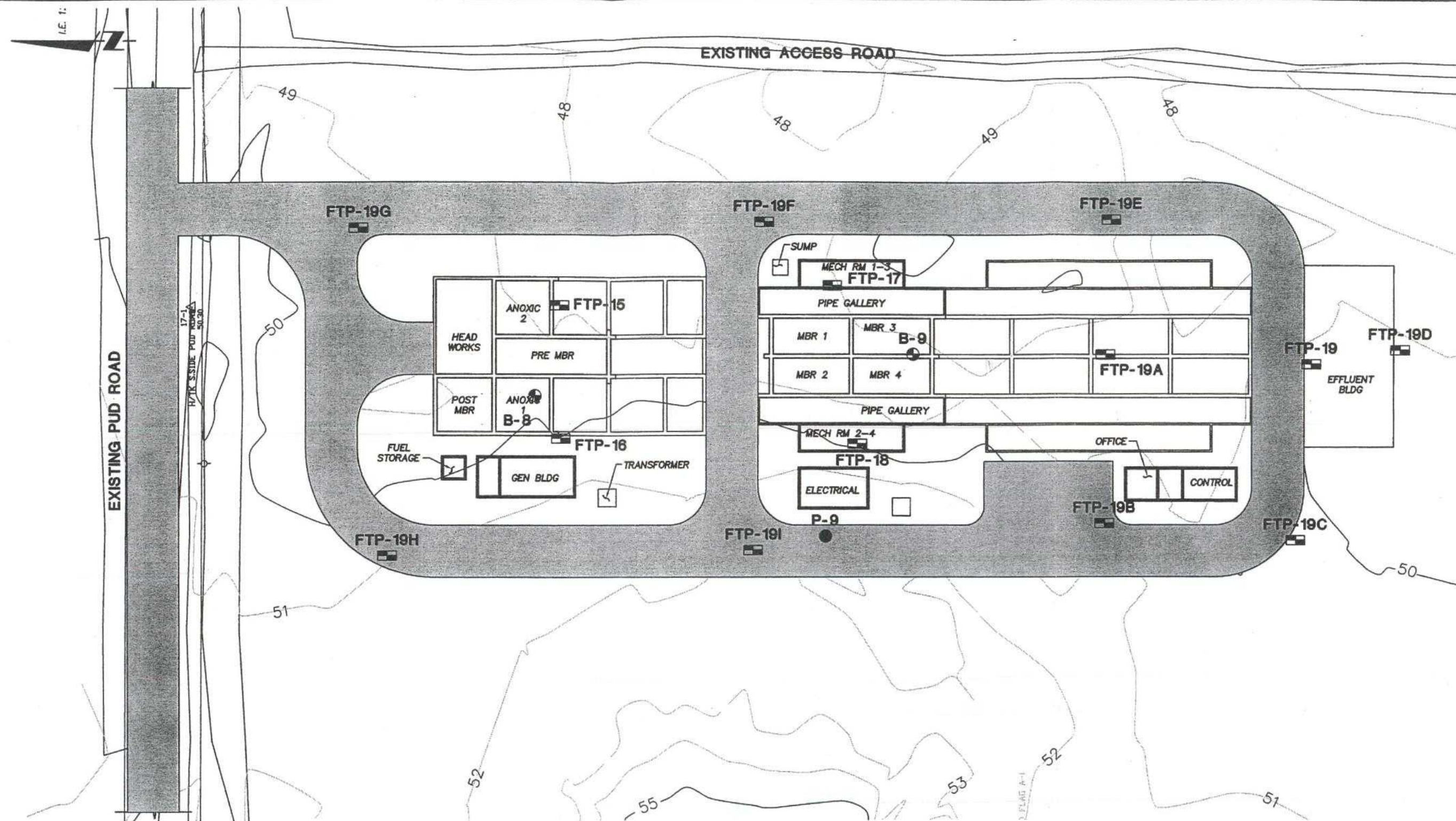
LEGEND

- TP-23  TEST PIT NUMBER AND APPROXIMATE LOCATION (AMEC)
- TP-112  TEST PIT NUMBER AND APPROXIMATE LOCATION (FOR TEMPORARY DEWATERING INFILTRATION STUDY) (AMEC)
- B-7  GROUNDWATER WELL/BORING (AMEC)
- P-9  PIEZOMETER (AMEC)
- I-4  INFILTRATION TEST NUMBER AND LOCATION (BY OTHERS) (INCLUDES NESTED PIEZOMETERS BY AMEC)
- TGW-24  GROUNDWATER WELL NUMBER AND APPROXIMATE LOCATION (LANDAU ASSOCIATES)
- CPT-1008  CPT NUMBER AND APPROXIMATE LOCATION (AMEC)
-  EFFLUENT PIPELINE



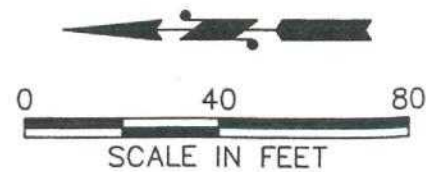
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SITE AND EXPLORATION PLAN
 EFFLUENT INFILTRATION PROJECT
 TULALIP WASTEWATER
 MARYSVILLE, WASHINGTON



LEGEND

- FTP-19I**
- TEST PIT NUMBER AND APPROXIMATE LOCATION (AMEC)
- B-9**
- BORING NUMBER AND APPROXIMATE LOCATION (AMEC)
- P-9**
- PIEZOMETER NUMBER AND APPROXIMATE LOCATION (AMEC)



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SITE AND EXPLORATION PLAN
WASTEWATER TREATMENT PLANT
TULALIP, WASHINGTON

FIGURE
2A

TABLE 6 - SUMMARY OF GROUNDWATER LEVEL READINGS

Description	Date Completed	Top of Monument Elevation (feet)	11/20/01 Reading		12/03/01 Reading		01/04/02 Reading		02/14/02 Reading		03/13/02 Reading	
			Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
MW P-1	11/7/01	54.95	9.18	45.77	8.62	46.33	7.20	47.75	Destroyed	N/A	Destroyed	N/A
MW P-2	11/7/01	51.66	12.20	39.46	11.71	39.95	11.70	39.96	Not Found	Not Found	9.66	42.00
MW P-3	11/7/01	63.30	6.16	57.14	5.46	57.84	5.20	58.10	4.60	58.70	4.75	58.55
MW P-4	11/7/01	52.05	8.44	43.61	7.44	44.61	6.40	45.65	5.45	46.60	6.16	45.89
MW P-5	11/7/01	47.94	5.98	41.96	5.06	42.88	4.60	43.34	4.05	43.89	4.57	43.37
MW P-6	11/8/01	53.37	Not Found	Not Found	2.60	50.77	2.80	50.57	2.60	50.77	2.75	50.62
MW P-7	11/8/01	49.57	3.94	45.63	3.19	46.38	3.00	46.57	2.60	46.97	2.88	46.69
MW P-8	11/8/01	54.18	2.47	51.71	2.14	52.04	2.50	51.68	2.30	51.88	2.57	51.61
MW P-9	11/14/01	51.80	6.56	45.24	5.32	46.48	4.50	47.30	3.75	48.05	4.38	47.42
MW B-1	11/6/01	61.31	18.85	42.46			16.90	44.41	16.15	45.16	15.72	45.59
MW B-2	11/5/01	57.39	17.17	40.22			14.90	42.49	14.25	43.14	14.40	42.99
MW B-3	11/7/01	51.96	15.70	36.26			13.70	38.26	13.00	38.96	12.93	39.03
MW B-4	11/8/01	54.47	5.80	48.67			4.00	50.47	3.40	51.07	3.46	51.01
MW B-5	11/12/01	58.42	3.80	54.62			3.10	55.32	2.55	55.87	2.77	55.65
MW B-6	11/13/01	52.77	4.48	48.29			3.50	49.27	3.05	49.72	3.40	49.37
MW B-7	11/9/01	49.86	5.72	44.14			4.10	45.76	3.60	46.26	3.70	46.16
MW I-1 E1	11/14/01	62.23	19.23	43.00								
MW I-1 E2	11/14/01	62.43	19.52	42.91			17.40	45.03	16.70	45.73	16.26	46.17
MW I-1 E3	11/14/01	61.80	19.15	42.65					16.45	45.35	Disturbed	N/A
MW I-1 S1	11/13/01	61.99	18.95	43.04								
MW I-1 S2	11/13/01	62.48	19.45	43.03								
MW I-1 S3	11/13/01	62.40	19.42	42.98								
MW I-2 E1	11/12/01	51.74	13.40	38.34					16.60	45.80	16.20	46.20
MW I-2 E2	11/12/01	51.81	13.55	38.26			11.60	40.21	10.65	41.16	10.79	41.02
MW I-2 E3	11/13/01	51.97	13.95	38.02					11.00	40.97		
MW I-2 S1	11/12/01	51.68	13.25	38.43								
MW I-2 S2	11/12/01	51.66	13.25	38.41								
MW I-2 S3	11/13/01	51.72	13.35	38.37								
MW I-3 W1	11/9/01	51.33	3.10	48.23					10.55	41.17		
MW I-3 W2	11/9/01	51.37	3.02	48.35								
MW I-3 S1	11/8/01	51.25	3.03	48.22					1.70	49.67		
MW I-3 S2	11/9/01	51.66	3.45	48.21								
MW I-3 S3	11/8/01	51.16	2.86	48.30								
TGW-017							12.88 ^a		11.72		11.72	
TGW-024							6.46 ^a		5.80		6.14	
TGW-039							13.55 ^a		12.89		13.62	

Notes:

Groundwater depths were measured from the top rim of the monuments, including TGW-XXX wells which were above ground completions.

a. Readings obtained on January 17, 2002

TABLE 7
SUMMARY OF DISSIPATION TESTS TO DETERMINE HEAD AT TULALIP
WASTEWATER EFFLUENT PROJECT

Northwest Cone Exploration Inc. 19-Feb-02

Exploration	Depth (meters)	Depth (feet)	Head (psi)	Head (feet)	Depth to H2O
1001	9.15	30.0	4.2	9.8	20.2
1002	9.20	30.2	4.7	10.9	19.2
1003	9.15	30.0	4.9	11.4	18.6
1004	9.40	30.8	6.7	15.6	15.3
1005	5.35	17.5	1.4	3.3	14.3
1005	9.40	30.8	7	16.3	14.6
1006	9.30	30.5	6.3	14.7	15.9
1007	9.15	30.0	5.3	12.3	17.7
1008	9.15	30.0	5.8	13.5	16.5

TABLE 8
Tulalip Wastewater Facilities
Verification Infiltration Data

Project Number: 1-91M-13845-A
January 10, 2002

AMEC Tulalip Casino project									
Infiltr test	Exploration	GW Depth (ft)	GW Elev (ft)	Silt Interbeds	Grain Size Distribution	D-10 mm	Hazen's I (in/hr)	Range of I (in/hr)	Interpreted I (in/hr)
IT-1	TP-21	>10	(<44)	None	med SAND trace silt			(12-45)	
	TP-22	>11	(<44)	None	fine-med SAND			(62)	
	TP-23	>11	(<44)	None	fine SAND	0.216	66		62
	TP-24	>12	(<44)	None	fine SAND	0.193	53	(12-53-62)	
IT-2	TP-25	>12	(<44)	None	fine-med SAND	0.196	54		12
	TP-26	>13	(<44)	None	fine-med SAND	0.181	46	(12-46-45)	
IT-3	TP-27	>12	(<44)	None	fine-med SAND				45
	TP-28	>12	(<44)	None	med SAND			(24-45)	40
IT-4	TP-29	>8	(48)	None	med-coarse SAND trace grav	0.263	98		31
	TP-32		(49)	None	med-coarse SAND trace grav				31
IT-5	TP-20	>11	(47)	None	med SAND trace silt			(20-150)	
	TP-33	>15	(45)	None	fine- med SAND trace silt				158
IT-6	TP-34	>14	(46)	None	fine- med SAND trace silt				128
	TP-35	>13	(47)	None	med-coarse SAND trace grav				128
AMEC Quil Ceda Blvd project									
Infiltr test	Exploration	GW Depth (ft)	GW Elev (ft)	Silt Interbeds	Grain Size Distribution	D-10 mm	Hazen's I (in/hr)	Range of I (in/hr)	Interpreted I (in/hr)
	TP-1	>8		None	med SAND trace silt			(5-17-24-57)	
	TP-2	>9		None	med SAND trace silt			(5-17-24-57)	
	TP-3	>8		None	med SAND trace silt			(5-17-24-57)	
	TP-4	>8		None	med SAND trace silt			(5-17-24-57)	
	TP-5	>6		None	med SAND	0.2	57	(5-17-24-57)	
	TP-6	>6		None	med SAND trace silt			(5-17-24-57)	24
	TP-15	>15		None	med SAND trace silt			(62)	62
AMEC Wastewater project									
Infiltr test	Exploration	GW Depth (ft)	GW Elev (ft)	Silt Interbeds	Grain Size Distribution	D-10 mm	Hazen's I (in/hr)	Range of I (in/hr)	Interpreted I (in/hr)
	B-1	19		between 10-15	med SAND some silt	0.125	22	(20-22-24)	22
	B-2	17		at 14'	fine-med SAND some silt	0.092	12	(12-24-40)	24
	B-3	16		at 5.5' & 13-15'	fine-med SAND some silt	0.11	17	(5-17-24)	17
	TP-6	>10		None	fine-med SAND			(20-24)	
	TP-8	>10		None	fine-med SAND trace silt			(20-24-128)	24
	TP-9	>10		None	fine-med SAND trace silt			(5-17-24)	17
Parametrix Infiltration study									
Infiltr test	Exploration	GW Depth (ft)	GW Elev (ft)	Silt Interbeds	Grain Size Distribution	D-10 mm	Hazen's I (in/hr)	Range of I (in/hr)	Interpreted I (in/hr)
I-1		19		between 10-15	fine-med SAND trace silt			20 min	20
I-2		16		at 5.5' & 13-15'	fine-med SAND trace silt			5.2 min	20
Wert New Casino project									
Infiltr test	Exploration	GW Depth (ft)	GW Elev (ft)	Silt Interbeds	Grain Size Distribution	D-10 mm	Hazen's I (in/hr)	Range of I (in/hr)	Interpreted I (in/hr)
I-1								33	
I-2								20	
I-3								42	
I-4								22	
I-5								25	
I-6								25	
I-7								15	
I-8								10	
I-9								9	
I-14								27	
I-15								11	22
A-Trench		17.5			fine-med SAND			10	10
Tulalip Storm Water Design Manual									
Infiltr test	Exploration	GW Depth (ft)	GW Elev (ft)	Silt Interbeds	Grain Size Distribution	D-10 mm	Hazen's I (in/hr)	Range of I (in/hr)	Interpreted I (in/hr)
Table 6.3					med SAND				24
								Average I	33

****Numbers in (parentheses) are estimated numbers

APPENDIX A

FIELD EXPLORATION PROCEDURES AND LOGS

APPENDIX A FIELD EXPLORATION PROCEDURES AND LOGS 1-91M-13845-A

The following paragraphs describe our procedures associated with the field explorations and field tests that we conducted for this project. Descriptive logs of our explorations are enclosed in this appendix.

Auger Boring Procedures

Our exploratory borings were advanced with a hollow-stem auger, using a truck-mounted drill rig operated by an independent drilling firm working under subcontract to AMEC. A geotechnical specialist from our firm continuously observed the borings, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to our laboratory for further visual examination and testing. After each boring was completed, the borehole was backfilled with soil cuttings and/or installed with an observation well or piezometer.

Soil samples were obtained by means of the Standard Penetration Test (SPT) per ASTM:D-1586. This testing and sampling procedure consists of driving a standard 2-inch-diameter steel split-spoon sampler 18 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count." If a total of 50 blows are struck within any 6-inch interval, the driving is stopped and the blow count is recorded as 50 blows for the actual penetration distance. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed *Boring Logs* describe the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring log. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted height on the drilling rods, and the water level measured in the borehole after the auger has been extracted.

Well Installation Procedures

Our groundwater observation wells consist of 2-inch-diameter PVC pipe, the lower 10 feet of which is finely slotted. The annular space around the slotted segment was backfilled with clean sand and gravel, and the upper portion of annulus was sealed with bentonite chips and

concrete. A flush-mounted monument was placed over the top of each wellhead for protection. The as-built configuration of each observation well is illustrated on the respective *Boring Log*. Our logs also show any post-drilling groundwater levels measured in the wells, along with the date of measurement.

CPT Probing Procedures

Our exploratory CPT probings consisted of advancing an electric penetrometer piezocone, using a truck-mounted probe rig operated by an independent firm working under subcontract to AMEC. A geotechnical specialist continuously observed the probings while electronic monitoring equipment in the probe rig automatically logged the subsurface conditions. After each probing was completed, the probehole was backfilled with a mixture of sand and bentonite chips.

Throughout the probing operation, soil and groundwater properties were measured by means of the Cone Penetrometer Test (CPT) per ASTM:D-3441. This testing procedure involves pushing an electric piezocone into the soil with hydraulic rams. The cone consisted of a standard design having a 60-degree tip apex, a 10-cm² projected area at the tip, a 150-cm² sleeve, and a porous element at the tip. The cone was advanced at a rate of approximately 2 cm per second, and the cone tip resistance (q_T), sleeve friction (f_s), and penetration porewater pressure (u_2) were recorded continuously during the tests. Pore pressure dissipation tests were also attempted at predetermined depths for the evaluation of hydraulic conductivity of the soils. As the penetrometer is pushed downward, the tip resistance, sleeve friction, and porewater pressure are measured electronically and plotted as a function of depth. Through interpretation, the resulting graphs can reveal soil types and groundwater levels, as well as the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed CPT graphs present the vertical plots of several soil properties and groundwater pressures measured by the cone penetrometer in each probing. These graphs also depict the Standard Penetration Resistance (N_{60}) corresponding to each test interval, based on published conversion charts. The enclosed *Probing Logs* describe the vertical sequence of soils encountered in each probing, based primarily on interpretation of the CPT graphs and supported by correlation with our logs of nearby borings.

Test Pit Procedures

Our exploratory test pits were excavated with a rubber-tired backhoe operated by a firm working under subcontract to Tulalip Tribe. A geotechnical specialist from our firm continuously observed the test pit excavations, logged the subsurface conditions, and obtained representative soil samples. All samples were stored in watertight containers and later transported to our laboratory for further visual examination and testing. After we logged each test pit, the hoe operator backfilled it with excavated soils and tamped the surface.

The enclosed *Test Pit Logs* indicate the vertical sequence of soils and materials encountered in each test pit, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational or undulating, our logs indicate the average contact depth. We estimated the relative density and consistency of the in-situ soils by means of the excavation characteristics and the stability of the test pit sidewalls. Our logs also indicate the approximate depths of any sidewall caving or groundwater seepage observed in the test pits, as well as all sample numbers and sampling locations.

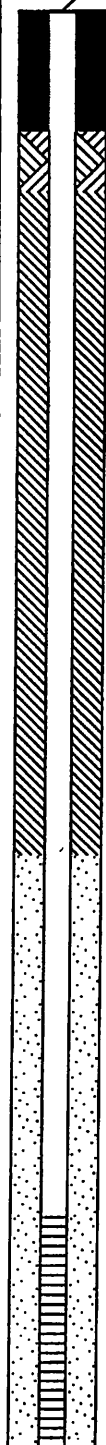
Elevation reference:

Well completed: November 06, 2001

Ground surface elevation: 61.5 Feet

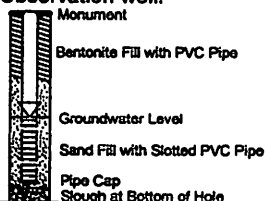
Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER		Page 1 of 5
0	Loose, moist, tan with some iron oxide staining, fine SAND with trace to some silt								
				S1	8				
				S2	10				
5	grades fine to medium SAND								
	2-inch thick lens of coarse SAND			S3	19				
				S4	36				
	grades dense, wet, medium to coarse SAND								
				S5	20				
10									
	2-inch thick lens of fine sandy SILT/ silty fine SAND			S6	21				
	3-inch thick lens of silty fine SAND								

LEGEND

Observation well:

**amec**11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 06, 2001

Drilling completed:

Logged By: WJL

Elevation reference: Ground surface elevation: 61.5 Feet		Well completed: November 06, 2001 Casing elevation:		AS-BUILT DESIGN			
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER
				S7	25		
	Medium dense, moist to wet, fine to medium SAND with trace to some silt interbedded with scattered lenses of fine sandy SILT/silty fine SAND			S8	23		
15				S9	24		
	Medium dense to dense, wet, tan, fine to medium SAND with trace to some silt			S10	33		
	becomes saturated			S11	26		ATD
20				S12	33		
	Dense, saturated, gray, fine to medium SAND with some silt			S13	62		
	began adding water to minimize heave						
	overdrilled and missed sample interval			NS14	0		

LEGEND

2.00-inch OD split-spoon sampler

No Sample

Groundwater level at time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Elevation reference:

Well completed: November 06, 2001

AS-BUILT DESIGN

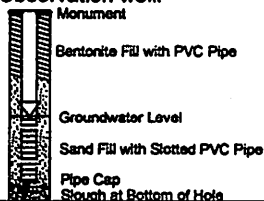
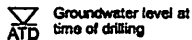
Ground surface elevation: 61.5 Feet

Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 3 of 5
								TESTING
25	SAND with some silt as above 1 foot of heave			S15	31			
	1 foot of heave			S16	31			
	1 foot of heave			S17	41			
	2 feet of heave, auger sank 6-inches during sampling			S18	50			
	grades some gravel and some silt							
30	horizontal bands of iron oxide staining auger sank 1 foot			S19	53			
	2.5 feet of heave			S20	45			
35	Medium dense, saturated, gray with horizontal iron oxide staining, fine to medium SAND with trace silt			S21	22			

LEGEND

Observation well:



11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 06, 2001

Drilling completed:

Logged By: WJL

Elevation reference:		Well completed: November 06, 2001		AS-BUILT DESIGN			
Ground surface elevation: 61.5 Feet		Casing elevation:					
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
	blowcount overstated, tube overfilled			S22	72		
				S23	29		
				S24	51		
40	horizontal bands of iron oxide staining blowcount overstated, tube overfilled			S25	35		
	grades dense, tan-gray, with some horizontal iron oxide staining 2 feet of heave			S26	79		
	grades slightly more coarse			S27	21		
45	Medium dense, saturated, gray, silty, fine to medium SAND, with 1/8-inch thick silt stringer in lower 6-inches of sample S-27 1 foot of heave			S28	27		
	grades to fine to coarse SAND with trace silt 1 foot of heave			S29	72		
	grades silty SAND with some gravel						

LEGEND

2.00-inch OD split-spoon sampler

No Sample

Groundwater level at time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

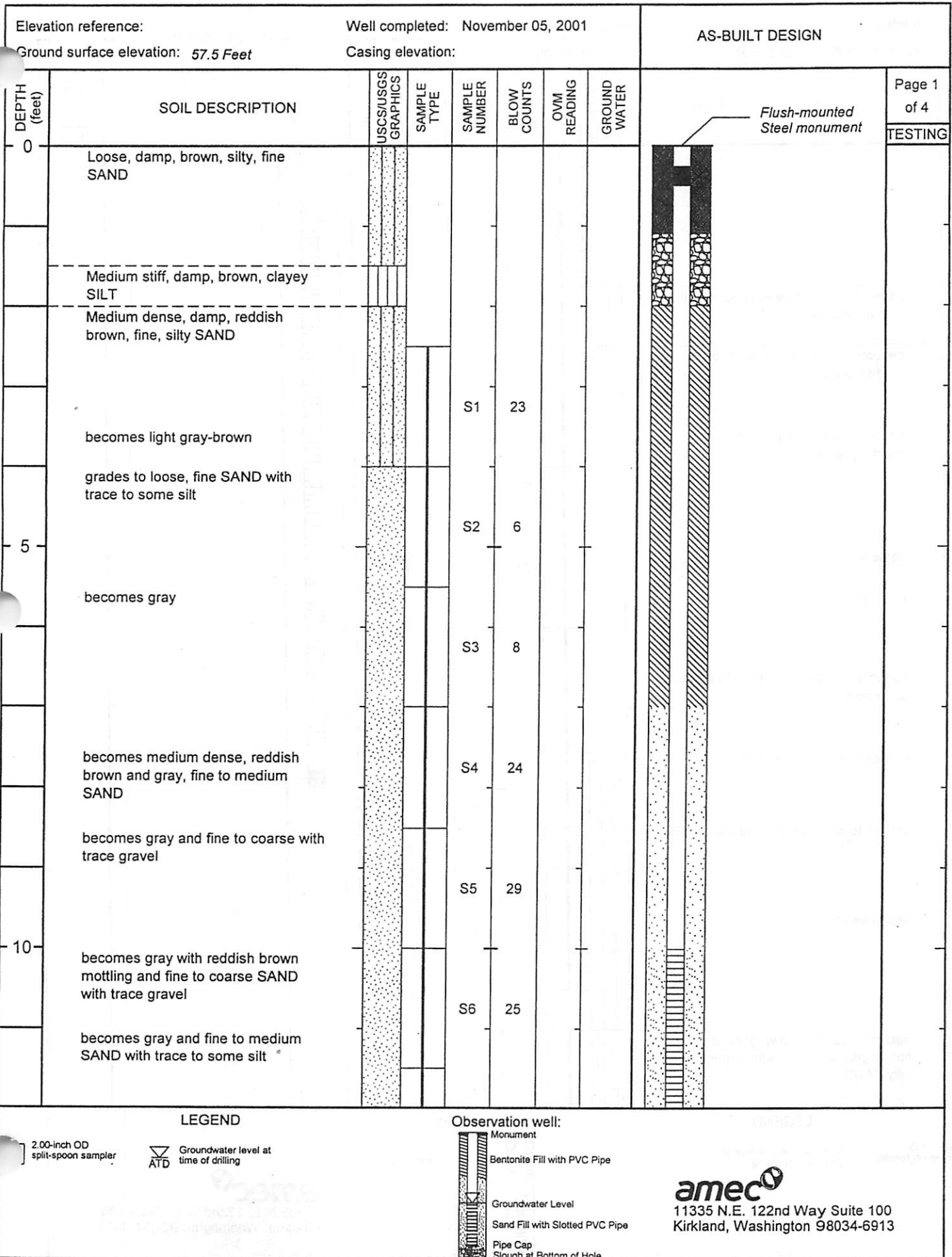
Pipe Cap

Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

4IN1 B156.GP/4IN1.GDT 3/14/02



Elevation reference: Ground surface elevation: 57.5 Feet		Well completed: November 05, 2001 Casing elevation:		AS-BUILT DESIGN				
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
				S7	30			
				S8a	29			
	Lens of silty, fine sand to sandy silt with trace gravel			S8b				
15	becomes dense and gray and reddish brown			S9	35			
	becomes gray and fine- to coarse-grained			S10	33			
	some silt			S11	31			
	becomes saturated						ATD	
	becomes medium dense with trace to some silt			S12	22			
20	grades to silty, fine SAND							
	grades to silty, fine to medium SAND			S13	23			
	becomes brown			S14	29			
	becomes dense, brown-gray, and fine to coarse SAND with some silt to silty SAND			S15	39			

LEGEND

2.00-inch OD split-spoon sampler

Groundwater level at time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Elevation reference:

Well completed: November 05, 2001

Ground surface elevation: 57.5 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER		Page 3 of 4
									TESTING
25	grades to silty, fine SAND								
	becomes medium dense 1.5 feet of heave - added water			S16	19				
	1 foot of heave			S17	28				
	grades to dense, fine to medium SAND with some silt to silty SAND			S18a	44				
	Lens of sandy silt			S18b					
30	becomes very dense, fine to medium SAND with some silt to silty SAND 1 foot of heave			S19	66				
	grades to silty, fine SAND 1 foot of heave								
	grades to dense, gray, and silty, fine to medium SAND			S20	47				
	Lens of clayey silt								
	grades to medium dense, gray-brown, silty, fine SAND								
	grades to fine to medium SAND with some silt			S21	26				
35	grades to very dense, silty, fine to medium SAND			S22	66				

LEGEND

2.00-inch OD
split-spoon sampler
 Groundwater level at
time of drilling

Observation well:

Monument

 Bentonite Fill with PVC Pipe

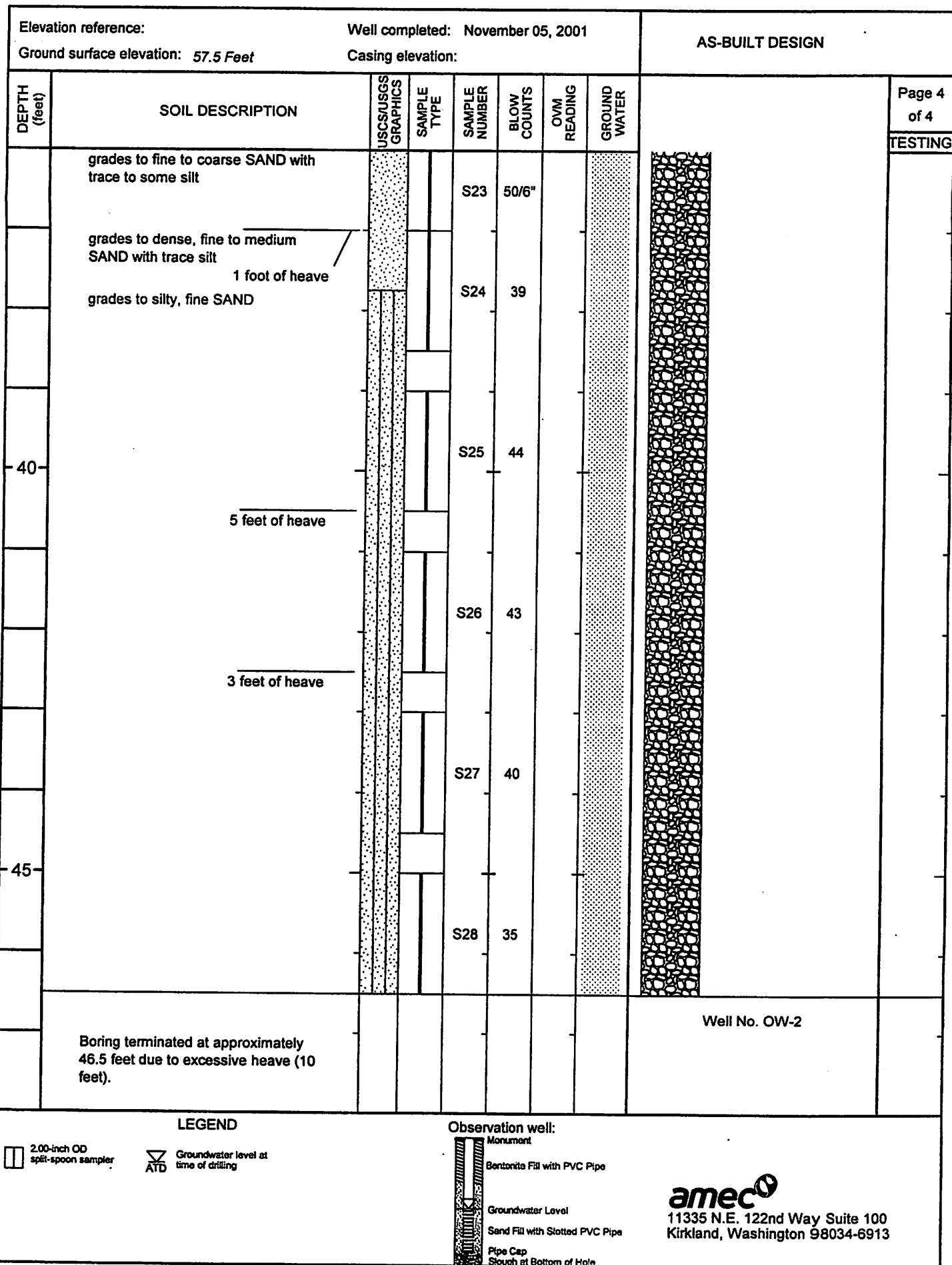
Groundwater Level

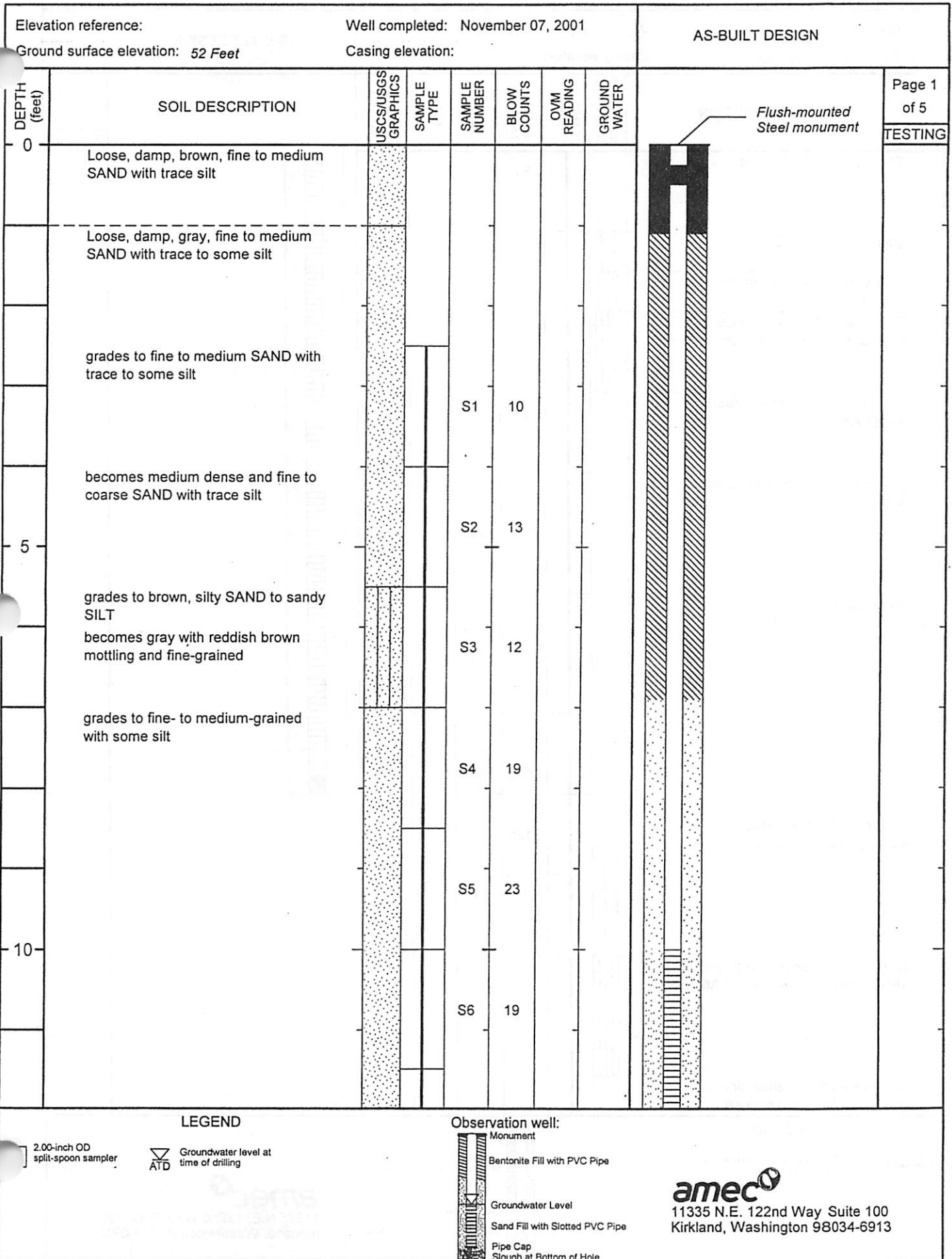
 Sand Fill with Slotted PVC Pipe

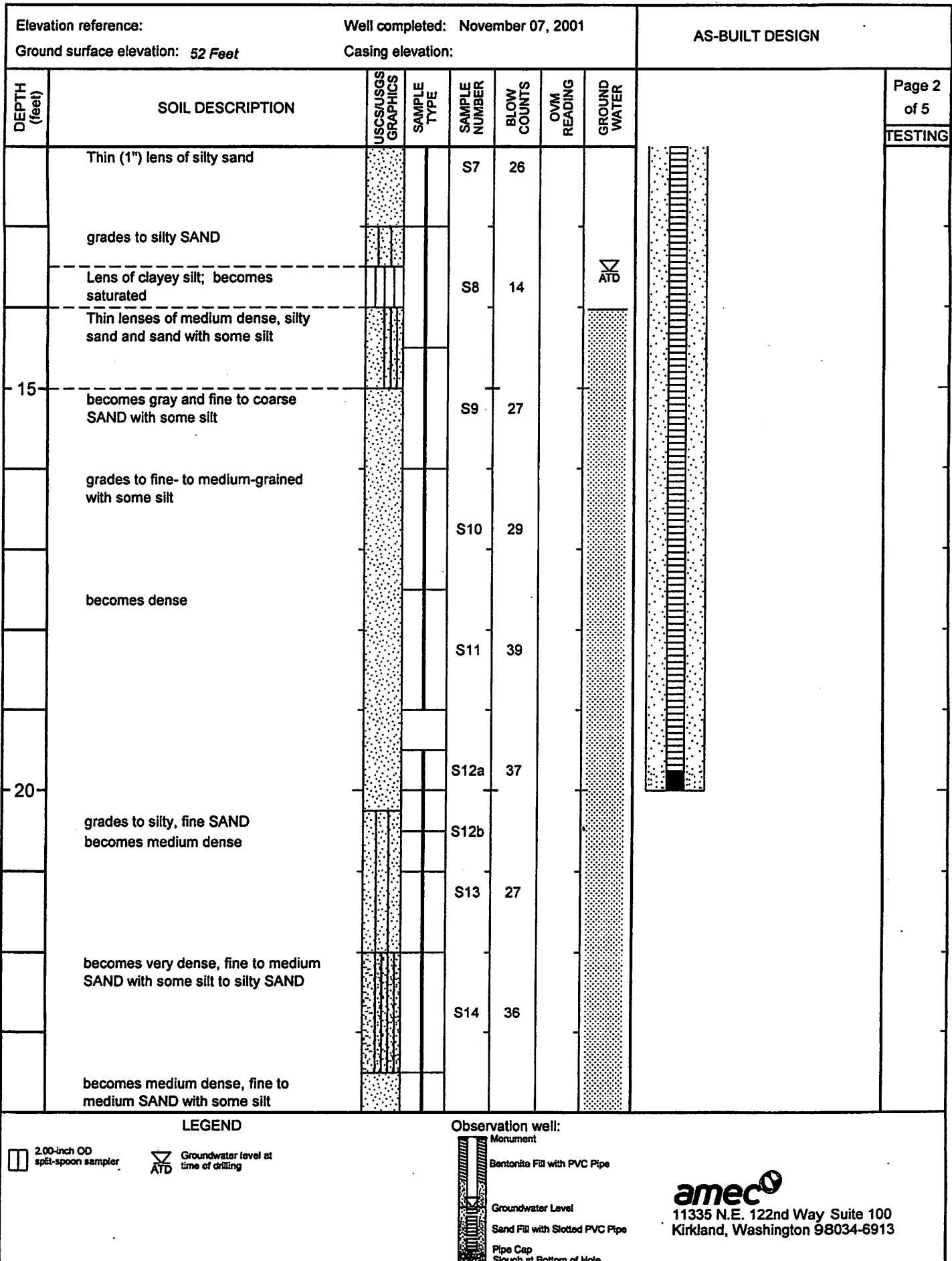
Pipe Cap

Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913







Elevation reference:

Well completed: November 07, 2001


AS-BUILT DESIGN

Ground surface elevation: 52 Feet

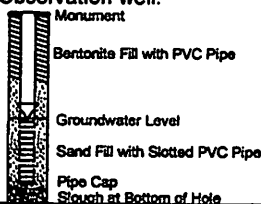
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 3 of 5
								TESTING
25	grades to silty SAND to SAND with some silt			S15	30			
				S16	31			
	becomes fine- to coarse-grained with some silt			S17	32			
				S18	54			
30	becomes very dense, silty, fine to medium SAND with some gravel			S19	46			
	becomes dense			S20	42			
				S21	46			
35	grades to fine SAND with trace to some silt							
	becomes reddish brown							

LEGEND

2.00-inch OD
split-spoon sampler Groundwater level at
time of drilling

Observation well:

**amec**11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 07, 2001

Drilling completed: November 07, 2001

Logged By: TMM

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 52 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVN READING	GROUND WATER	Page 4 of 5
	becomes medium dense and gray grades to silty SAND			S22	30			TESTING
	becomes fine- to medium-grained with several 1/4-inch interbeds (from 37.5 feet to 39 feet) of silty sand			S23	23			
	grades to SAND with trace to some silt			S24	27			
40	Lens of silty sand							
	becomes dense, reddish brown, and fine-grained			S25	44			
	becomes gray and fine- to medium-grained							
	becomes very dense, silty SAND to SAND with some silt			S26	54			
	grades to reddish brown, silty, fine SAND			S27	52			
45	becomes gray, silty SAND			S28	51			
	becomes dense			S29a	32			
	Interlayers (from 47 feet to 47.5 feet) of dense, blue-gray, fine- to medium sand and silt and silty sand			S29b				

LEGEND

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Observation well:



Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec
11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 07, 2001

Drilling completed: November 07, 2001

Logged By: TMM

Elevation reference:

Well completed: November 07, 2001

AS-BUILT DESIGN

Ground surface elevation: 52 Feet

Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 5 of 5
								TESTING
	becomes very dense, blue-gray, fine to medium SAND with trace to some silt (Assumed to be clean sand, based on no sample recovery)			S30	39			
50				S31	32			
	Boring terminated at approximately 50.5 feet Mud was added to hollow stem auger to stabilize hole during drilling Observation well installed approximately 15 feet from boring location							Well No. OW-3
55								
60								

LEGEND

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Observation well:



Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap
Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Elevation reference:

Well completed: November 08, 2001

Ground surface elevation: 54.5 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	AS-BUILT DESIGN	Page 1 of 5
0	Loose, moist, dark brown, silty SAND with prevalent organics and cobbles up to 8 inches in diameter								TESTING
	Loose, damp, gray, silty SAND to SAND with some silt								
	Medium stiff, moist, reddish brown, sandy SILT								
				S1	5				
	Loose, moist, light reddish brown, silty, fine to medium SAND								
5				S2	8				
	becomes gray, fine to coarse SAND with trace to some silt								
	becomes reddish brown, silty, fine to medium SAND with scattered gravel from 6' to 6.5'								
	becomes saturated and gray								
	becomes medium dense								
				S3	8				
				S4	15				
				S5	17				
10	grades to fine to medium SAND with some silt								
				S6	14				
	grades to silty, fine SAND								
				S7a	13				

LEGEND

2.00-inch OD
split-spoon sampler
 Groundwater level at
time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

 11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

Logged By: TMM

Elevation reference:

Well completed: November 08, 2001

Ground surface elevation: 54.5 Feet


Casing elevation:

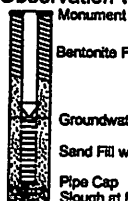
AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	Page 2 of 5
								TESTING
				S7b				
	grades to fine- to medium-grained			S8	14			
15	becomes loose, fine SAND with some silt			S9	6			
	grades to silty, fine to medium SAND			S10a	7			
	grades to silty fine SAND to sandy SILT			S10b				
	grades to SAND with some silt to silty SAND			S10c				
	grades to fine to medium SAND with some silt							
				S11	10			
	some gravel			S12	8			
20								
				S13	10			
	becomes loose and fine- to coarse-grained			S14	5			

LEGEND

Observation well:

 2.00-inch OD
split-spoon sampler

 Groundwater level at
time of drilling


Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap
Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

Logged By: TMM

Elevation reference:

Well completed: November 08, 2001

AS-BUILT DESIGN

Ground surface elevation: 54.5 Feet

Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OM READING	GROUND WATER	Page 3 of 5
								TESTING
25	becomes very loose, silty, fine SAND			S15	1			
				S16	0			
	becomes loose			S17a	7			
	Lens of sandy silt			S17b				
30				S18	10			
	grades to fine to medium SAND with some silt			S19	9			
				S20	9			
	grades to fine-grained with trace to some silt			S21a	9			
				S21b				
35	becomes medium dense and fine- to medium-grained with some silt			S22	12			

LEGEND

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

Logged By: TMM

Elevation reference:

Well completed: November 08, 2001


Ground surface elevation: 54.5 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	Page 4 of 5
								TESTING
	grades to fine-grained			S23	23			
	grades to fine to medium SAND with silt to silty SAND			S24	27			
				S25	19			
-40-	2 feet of heave - out of mud - added water							
	grades to fine to medium SAND with some silt			S26	22			
				S27	34			
	becomes dense, silty, fine SAND							
	3 feet of heave							
-45-	becomes medium dense, fine to medium SAND with some silt to silty SAND			S28	17			
	grades to silty, fine SAND							
	5 feet of heave - flushed with water - added mud			S29	16			
	grades to fine to medium SAND with some silt			S30	17			

LEGEND

 2.00-inch OD
split-spoon sampler

 Groundwater level at
time of drilling

Observation well:

 Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

4IN1 B2347.GPJ WA4IN1.GDT 3/14/02

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

Logged By: TMM

Logged By: TMM

Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 58.5 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	Page 1 of 5
0	Moist, loose to medium dense, dark brown, silty, fine to medium SAND							Flush-mounted Steel monument	TESTING
	Moist, medium dense, light brown to tan, fine to coarse SAND with some silt			S1	18				
	grades to fine- to medium-grained								
				S2	17				
5									
				S3	20				
				S4	16				
	grades to light brown to tan, fine to medium SAND with some silt and trace gravel								
				S5	20				
10									
	becomes fine- to coarse-grained								
				S6	25				
	becomes gray and grades to silty fine SAND; gravel lens at 11 feet trace gravel								

LEGEND

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole



11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 12, 2001

Drilling completed:

Logged By: ARC

Elevation reference: Ground surface elevation: 58.5 Feet		Well completed: November 12, 2001 Casing elevation:		AS-BUILT DESIGN				
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	Page 2 of 5 TESTING
				S7	21			
	grades to fine- to medium-grained SAND with some silt with trace gravel			S8	20			
15	grades to fine to medium SAND with some silt			S9	14			
	grades to silty fine to medium SAND with trace gravel			S10	17			
	grades to medium coarse SAND with trace silt; gravel lens at 17.5 feet			S11	13			
	grades to silty, fine to medium SAND			S12	14			
20	grades to silty, fine SAND			S13	26			
				S14	16			
	grades to silty, fine to coarse SAND							

LEGEND

2.00-inch OD split-spoon sampler

Groundwater level at time of drilling

Observation well:

Monument
 Bentonite Fill with PVC Pipe
 Groundwater Level
 Sand Fill with Slotted PVC Pipe
 Pipe Cap Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 12, 2001 Drilling completed: Logged By: ARC

Elevation reference:

Well completed: November 12, 2001

AS-BUILT DESIGN

Ground surface elevation: 58.5 Feet

Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 3 of 5
								TESTING
25	grades to silty, fine to medium SAND with trace gravel			S15	11			
	becomes dense			S16	15			
				S17	31			
	becomes loose to medium dense 2 feet of heave			S18	8			
30	becomes medium dense, fine to medium SAND with some silt			S19	15			
	grades to silty, fine SAND 3 feet of heave			S20	25			
	grades to fine SAND with some silt			S21	16			
	grades to silty, fine to medium SAND			S22	17			
35	grades to silty, fine SAND							

LEGEND

2.00-inch OD
split-spoon sampler
 Groundwater level at
time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap
Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913


Drilling started: November 12, 2001


Drilling completed:

Logged By: ARC


Elevation reference:		Well completed: November 12, 2001						AS-BUILT DESIGN	
Ground surface elevation: 58.5 Feet		Casing elevation:							
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 4 of 5 TESTING	
				S23	18				
	grades to fine to medium SAND with some silt and gravel			S24	24				
	grades to silty, fine SAND			S25	19				
40	grades to silty fine SAND to fine sandy SILT			S26	27				
	becomes dense			S27	31				
	becomes medium dense and grades to silty, fine SAND			S28	16				
45				S29	20				
	grades to silty, fine to medium SAND			S30	12				
	Interbeds of silt and fine sand								
	becomes dense								


LEGEND


 2.00-inch OD split-spoon sampler


 Groundwater level at time of drilling


Observation well:


 Monument

 Bentonite Fill with PVC Pipe

 Groundwater Level

 Sand Fill with Slotted PVC Pipe

 Pipe Cap

 Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 12, 2001

Drilling completed:

Logged By: ARC

Elevation reference:

Well completed: November 12, 2001

AS-BUILT DESIGN

Ground surface elevation: 58.5 Feet

Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 5 of 5
								TESTING
				S31	34			
50				S32	40			
	Boring terminated at approximately 50.5 feet Mud added to hollow stem auger to stabilize hole during drilling Observation well installed approximately 6 feet from boring location							Well No. OW-5
55								
60								

LEGEND

Observation well:

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap
Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 12, 2001

Drilling completed:

Logged By: ARC

Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 52.5 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	AS-BUILT DESIGN	Page 1 of 5
0	Moist, medium stiff to stiff, dark brown, silty, fine SAND with some organics (Sandy Topsoil)								TESTING
	Moist, loose, tan to brown with orange mottling, silty, fine SAND with trace organics			S1	9				
	grades to silty, fine to medium SAND			S2	14				
5	becomes wet to saturated and grades to fine to medium SAND with some silt and trace gravel			S3	16		ATD		
	grades to fine to coarse SAND with trace silt and gravel			S4	14				
	becomes loose, saturated, gray and grades to silty, fine to medium SAND with trace gravel; gray silt lenses from 9 feet to 10 feet			S5	10				
10	becomes medium dense			S6	8				
	Interbeds of fine sandy SILT and silty fine SAND								

LEGEND

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Stotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 13, 2001

Drilling completed:

Logged By: ARC

Elevation reference:

Well completed: November 12, 2001


Ground surface elevation: 52.5 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	Page 2 of 5
				S7	12			TESTING
	grades to silty, fine to medium SAND			S8	18			
	Lens of silt							
15	grades to fine to medium SAND with trace silt and some gravel			S9	22			
	some silt			S10	25			
				S11	20			
	some silt			S12	19			
20	trace silt			S13	21			
	4 inches of heave							
	2 feet of heave			S14	15			
	becomes dense with trace silt							

LEGEND

 2.00-inch OD
split-spoon sampler

 Groundwater level at
time of drilling

Observation well:

 Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 13, 2001

Drilling completed:

Logged By: ARC

Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 52.5 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 3 of 5
								TESTING
25	becomes medium dense			S15	36			
				S16	23			
				S17	26			
	Lens of fine sandy silt to silty fine sand becomes dense and grades to fine to medium SAND with some silt 4 inches of heave			S18 A, B	41			
	Lens of clayey silt			NS				
30	2 feet of heave							
	becomes medium dense and grades to fine SAND with some silt			S20	14			
	grades to silty fine SAND			S21	20			
35	Interbeds of silt and silty fine SAND			S22 A, B	26			
	2 feet of heave			NS				

LEGEND

2.00-inch OD
split-spoon samplerGroundwater level at
time of drilling

Observation well:



Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec

 11335 N.E. 122nd Way Suite 100
 Kirkland, Washington 98034-6913

Drilling started: November 13, 2001

Drilling completed:

Logged By: ARC

Elevation reference:

Well completed: November 12, 2001


Ground surface elevation: 52.5 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OM READING	GROUND WATER	Page 4 of 5
								TESTING
	becomes dense and grades to fine to coarse SAND with trace silt grades to fine SAND with some silt			S24	32			
	becomes medium dense grades to silty, fine to medium SAND			S25	20			
40	4 inches of heave			S26	23			
				S27	31			
	Lens of silt			S28	22			
45	grades to silty fine SAND to fine sandy SILT grades to layered fine sandy SILT			S29	16			
	grades to dense, silty, fine SAND sample rod dropped 25 feet with 50 feet of rod in the hole			S30	46			
	Interbeds of fine sand and silt							

LEGEND

 2.00-inch OD
split-spoon sampler

 Groundwater level at
time of drilling

Observation well:

 Monument

 Bentonite Fill with PVC Pipe

 Groundwater Level

 Sand Fill with Slotted PVC Pipe

 Pipe Cap

 Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 13, 2001

Drilling completed:

Logged By: ARC

Elevation reference:		Well completed: November 12, 2001						AS-BUILT DESIGN	
Ground surface elevation: 52.5 Feet		Casing elevation:							
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 5 of 5	
								TESTING	
				S31	21				
50				S32	26				
	Boring terminated at 50.5 feet Mud added to hollow stem auger to stabilize hole during drilling Observation well installed approximately 10 feet from boring location							Well No. OW-6	
55									
60									

LEGEND

Observation well:

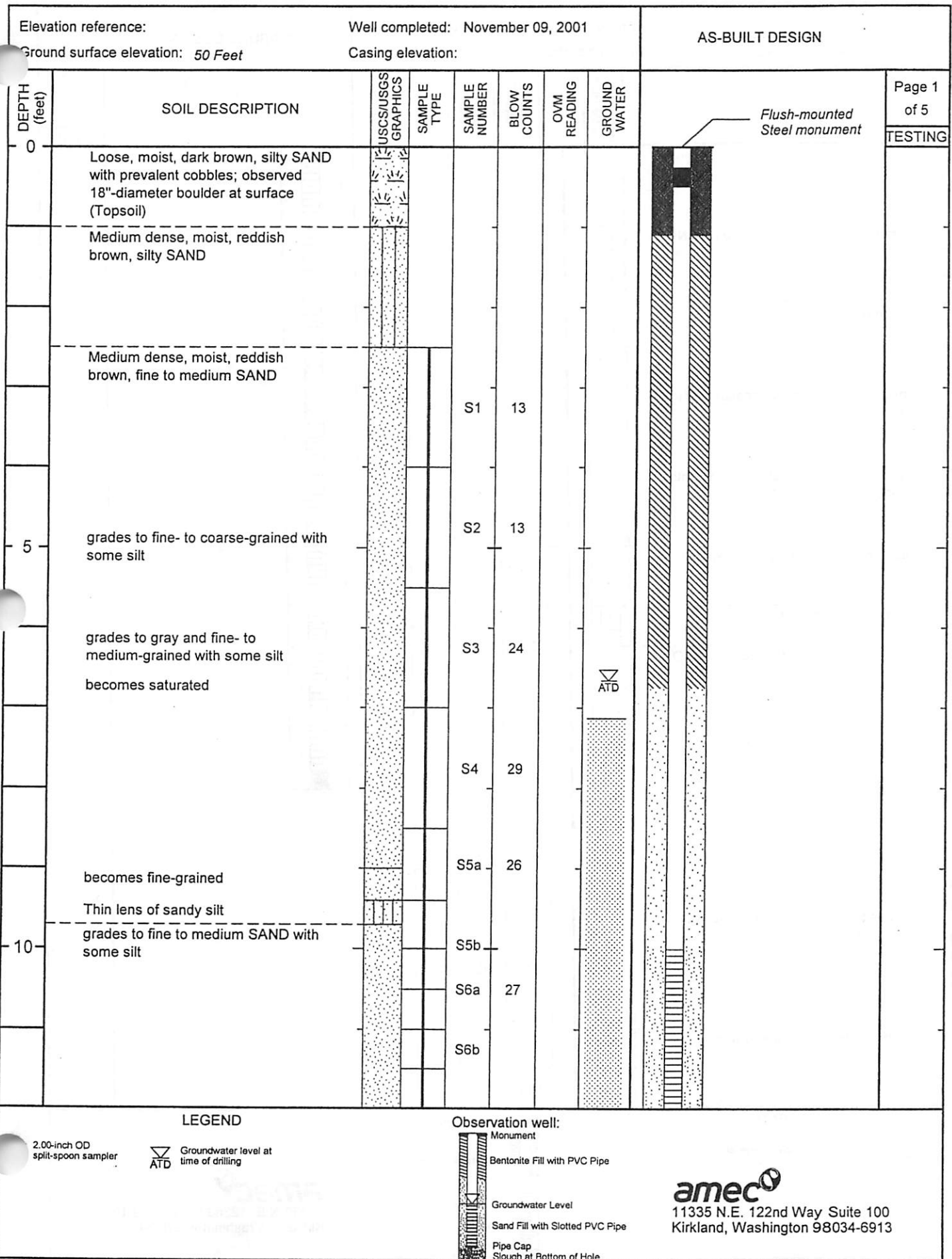
2.00-inch OD
split-spoon sampler

ATD Groundwater level at
time of drilling

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Stouch at Bottom of Hole

amec


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913




4IN1 B2347.GPJ - W44IN1.GDT 3/14/02


Elevation reference:		Well completed: November 09, 2001						AS-BUILT DESIGN	
Ground surface elevation: 50 Feet		Casing elevation:							
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	Page 2 of 5 TESTING	
				S7	11				
	grades to silty, fine to medium SAND								
	becomes reddish brown			S8	22				
15	becomes gray, fine to medium SAND with some silt			S9	26				
	grades to fine- to coarse-grained with trace silt			S10a	28				
	becomes fine-grained with some silt			S10b					
	Lens of fine, sandy silt								
	grades to silty, fine to medium SAND			S11	22				
20				S12	29				
	grades to fine to medium SAND with some silt			S13	25				
	becomes dense and fine-grained			S14	43				


LEGEND


 2.00-inch OD split-spoon sampler


 Groundwater level at time of drilling


Observation well:


 Monument

 Bentonite Fill with PVC Pipe

 Groundwater Level

 Sand Fill with Slotted PVC Pipe

 Pipe Cap

 Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Elevation reference:

Well completed: November 09, 2001

Ground surface elevation: 50 Feet

Casing elevation:

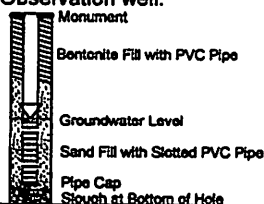
AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 3 of 5
								TESTING
25	becomes medium dense, silty, fine SAND			S15	29			
	becomes dense and fine to medium SAND with some silt			S16	32			
	becomes fine- to coarse-grained with some silt			S17	36			
30	becomes dense and fine- to medium-grained with some silt			S18	31			
	becomes medium dense, silty, fine SAND			S19	23			
	grades to fine- to medium-grained			S20	18			
	grades to fine to medium SAND with some silt			S21	39			
35	becomes medium dense, silty fine SAND			S22a	22			
	grades to fine to medium SAND with some silt							

LEGEND

2.00-inch OD
split-spoon sampler
 Groundwater level at
time of drilling

Observation well:


amec
11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 09, 2001

Drilling completed: November 09, 2001

Logged By: TMM

Elevation reference:

Well completed: November 09, 2001

Ground surface elevation: 50 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 4 of 5
								TESTING
	becomes dense with trace to some silt			S22b				
				S23	47			
	becomes medium dense, silty, fine SAND			S24	26			
				S25	15			
-40-	grades to fine to medium SAND with some silt			S26	18			
	Lens of clayey silt			S27	18			
	grades to silty, fine SAND			S28	14			
-45-				S29	27			
				S30	27			
	Lens of sandy silt to silty sand							

LEGEND

 2.00-inch OD split-spoon sampler

 Groundwater level at time of drilling

Observation well:

 Bentonite Fill with PVC Pipe

 Groundwater Level

 Sand Fill with Slotted PVC Pipe

 Pipe Cap
 Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

4IN1 B2347 GPJ WA4IN1.GDT 3/14/02

Drilling started: November 09, 2001

Drilling completed: November 09, 2001

Logged By: TMM

Elevation reference:		Well completed: November 09, 2001						AS-BUILT DESIGN	
Ground surface elevation: 50 Feet		Casing elevation:							
DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER		Page 5 of 5
	Very stiff, saturated, gray, SILT to clayey SILT			S31	13				TESTING
50									
	Boring terminated at approximately 50 feet Mud was added to hollow stem auger to stabilize hole during drilling Observation well installed approximately 10 feet from boring							Well No. OW-7	

LEGEND

2.00-inch OD
split-spoon sampler



**Groundwater level at
time of drilling**

Observation well:



Valley View Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

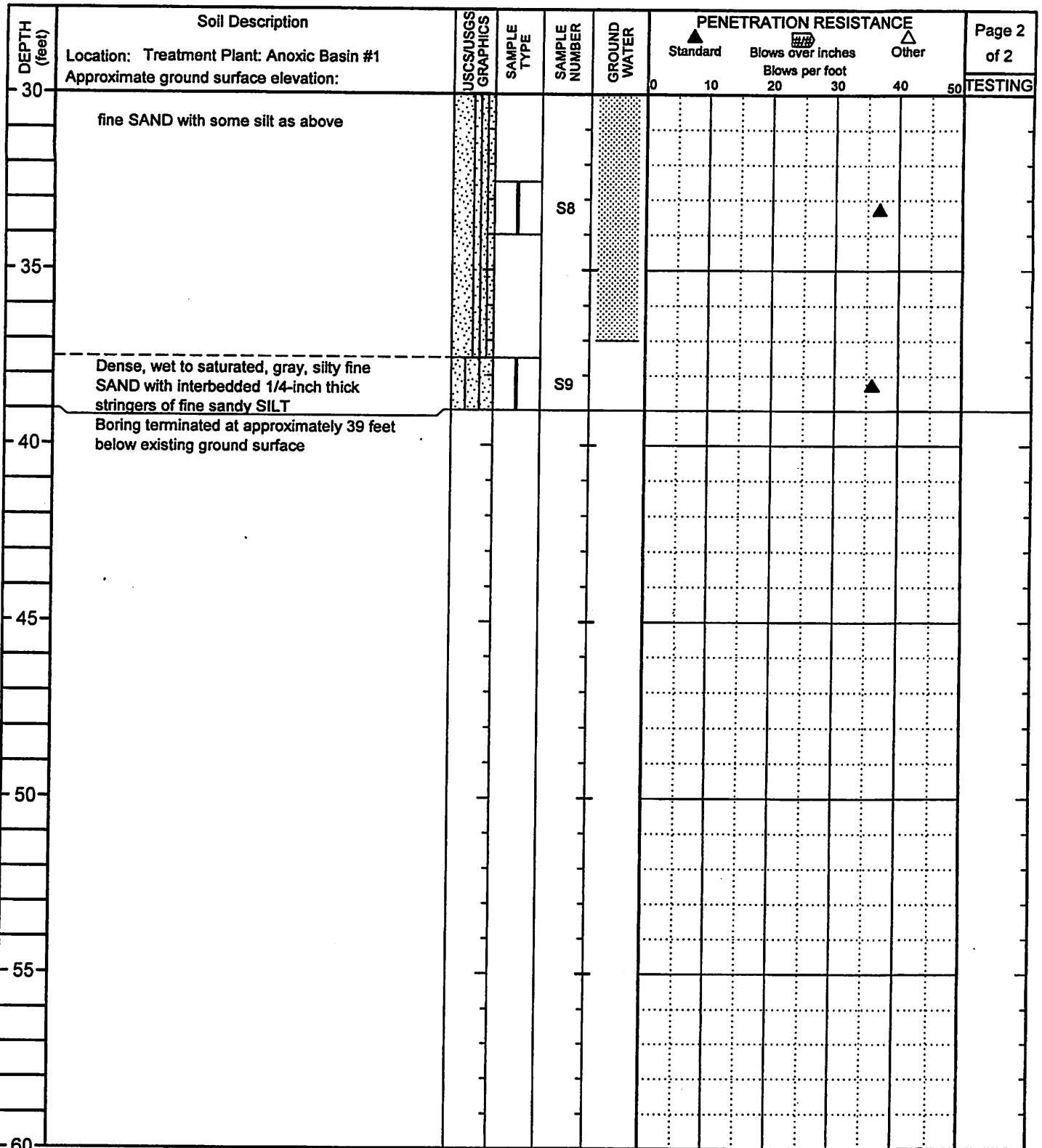
Pipe Cap

Slough at Bottom of Hole

amec

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Kirkland, Washington 98034-6913





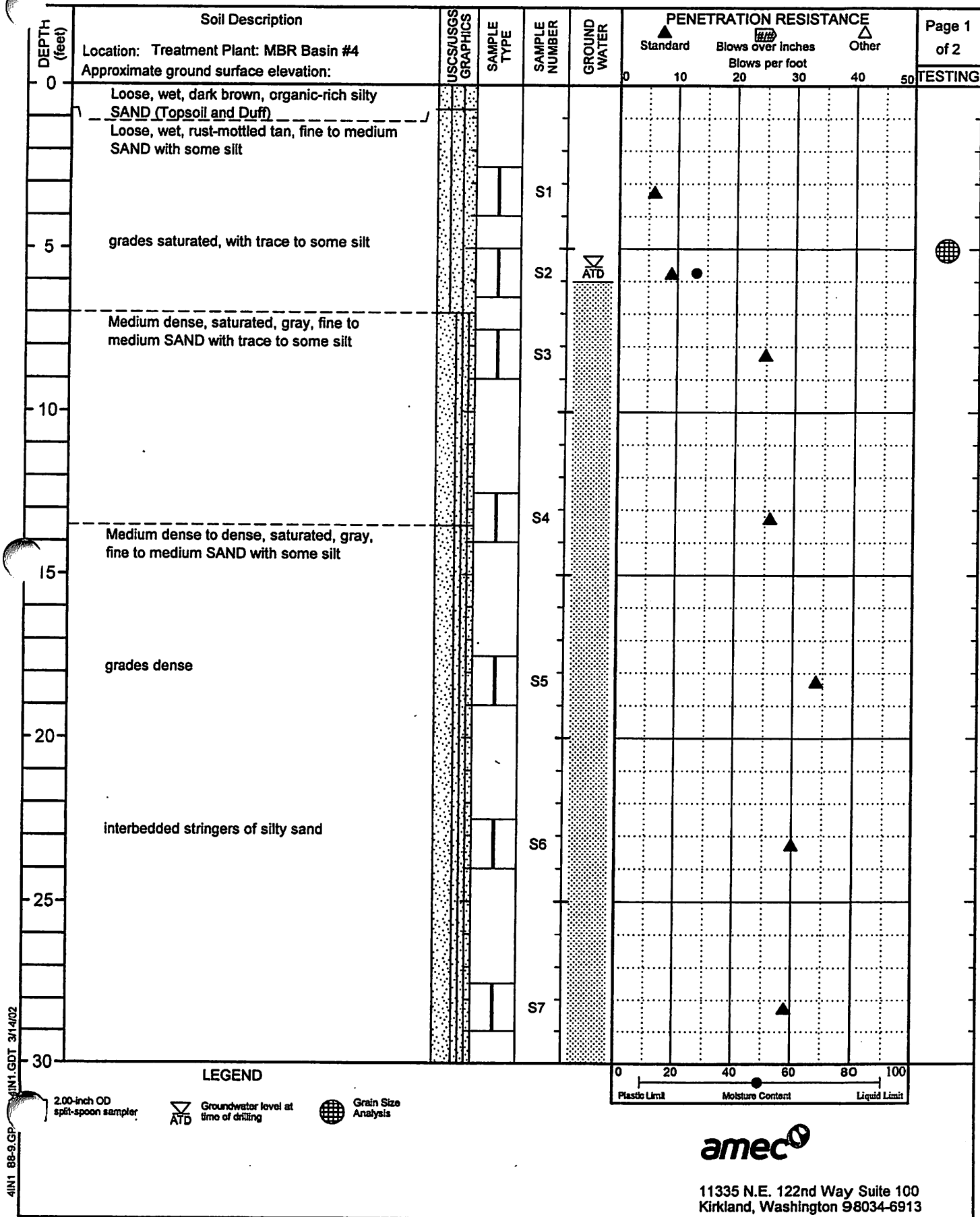
LEGEND

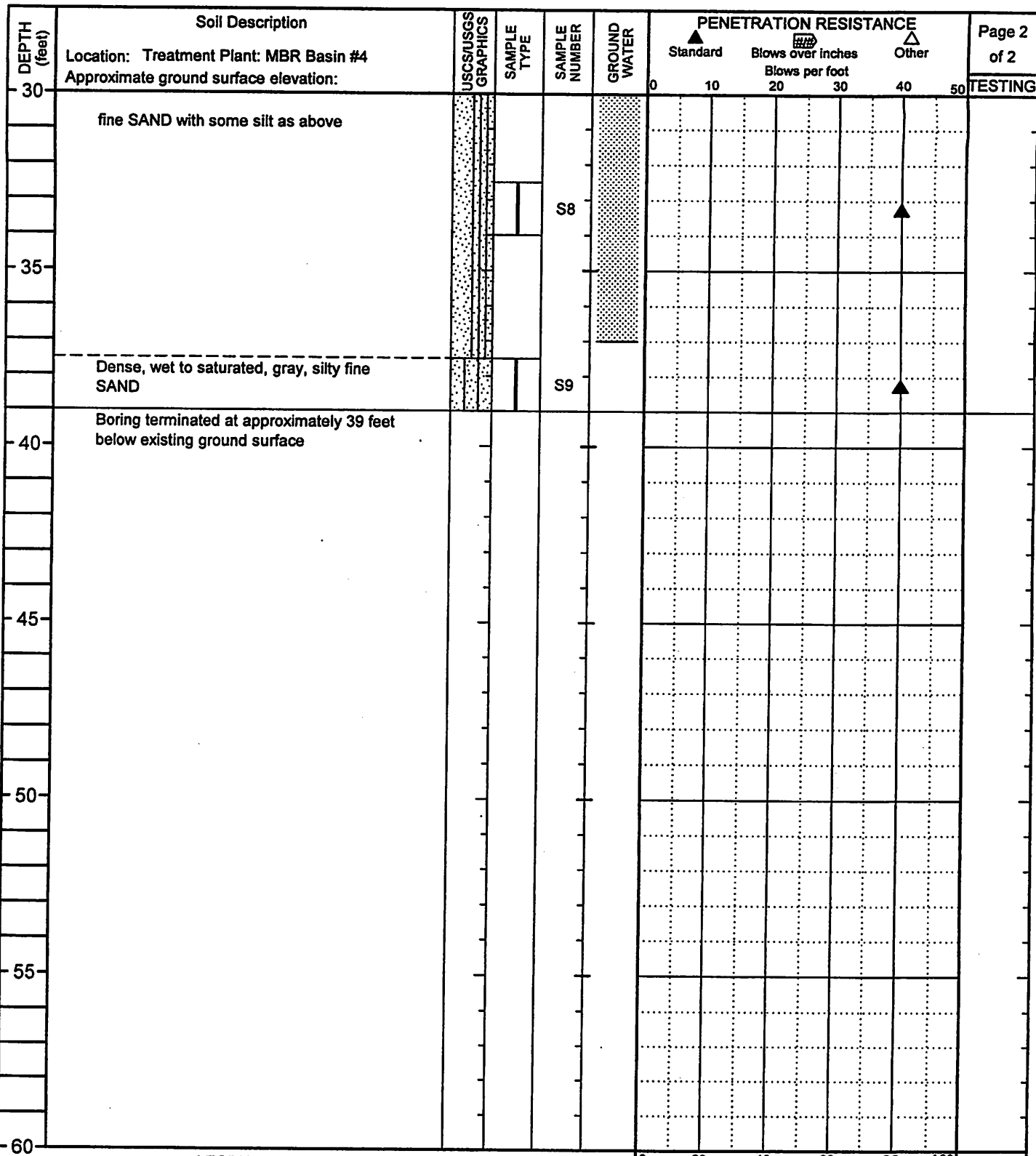
2.00-inch OD split-spoon sampler

Groundwater level at time of drilling

Grain Size Analysis

**amec**11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913





LEGEND

2.00-inch OD split-spoon sampler

Groundwater level at time of drilling

Grain Size Analysis

 0 20 40 60 80 100
Plastic Limit Moisture Content Liquid Limit

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Kirkland, Washington 98034-6913

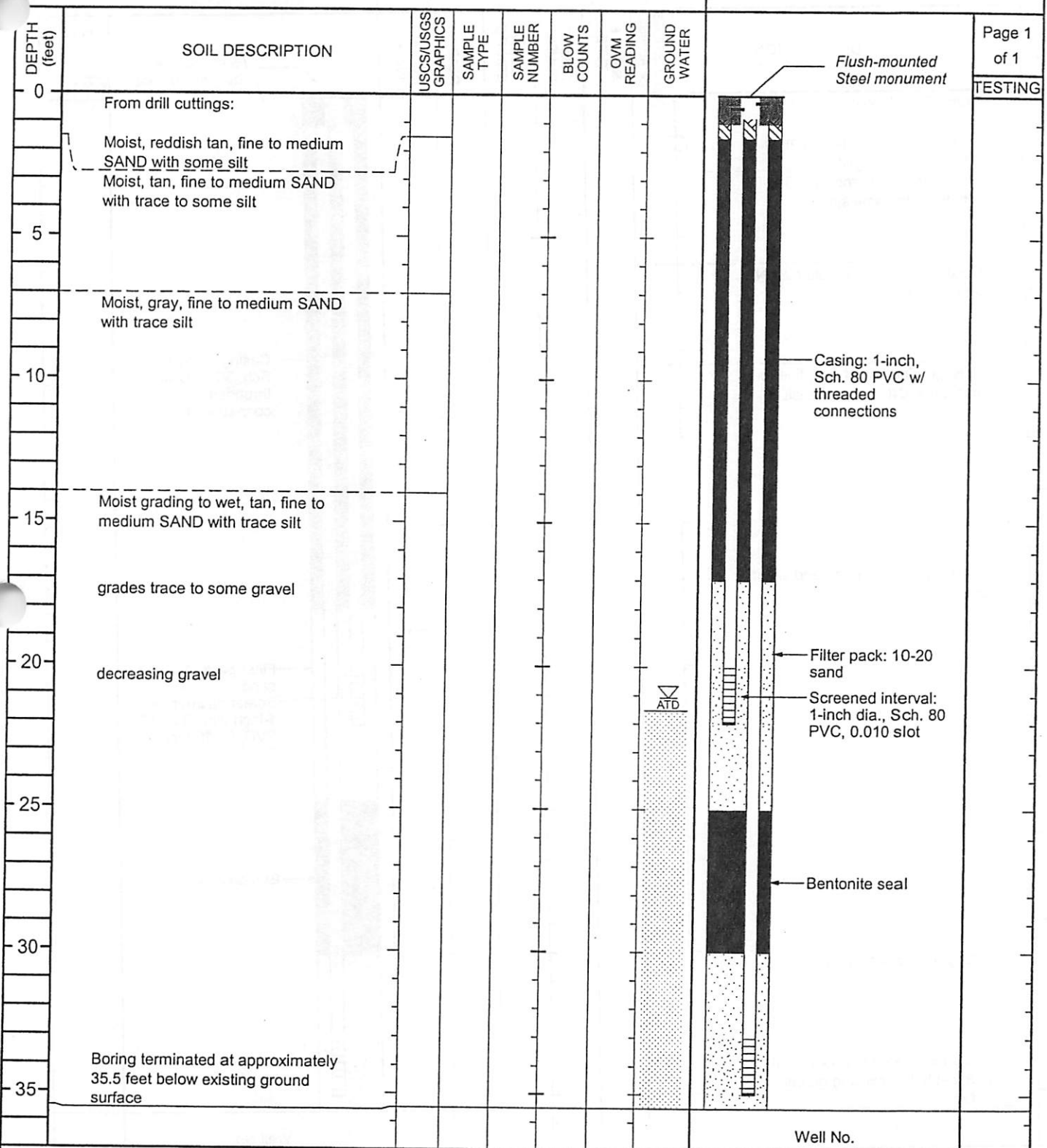
Elevation reference:

Well completed: November 14, 2001

Ground surface elevation: 62.23 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

ATD Groundwater level at time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 14, 2001

Drilling completed: November 14, 2001

Logged By: WJL

Elevation reference:

Well completed: November 14, 2001

Ground surface elevation: 62.43 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	From drill cuttings: Moist, reddish tan, fine to medium SAND with some silt Moist, tan, fine to medium SAND with trace to some silt							
5	Moist, gray, fine to medium SAND with trace silt							
10	Moist grading to wet, tan, fine to medium SAND with trace silt							
15	grades wet, grayish tan and slightly coarser							
20								
25								
30	cuttings grade saturated							
35	Boring terminated at approximately 35.5 feet below existing ground surface							

Flush-mounted
Steel monumentCasing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sand
Screened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot


Bentonite seal

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:



Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

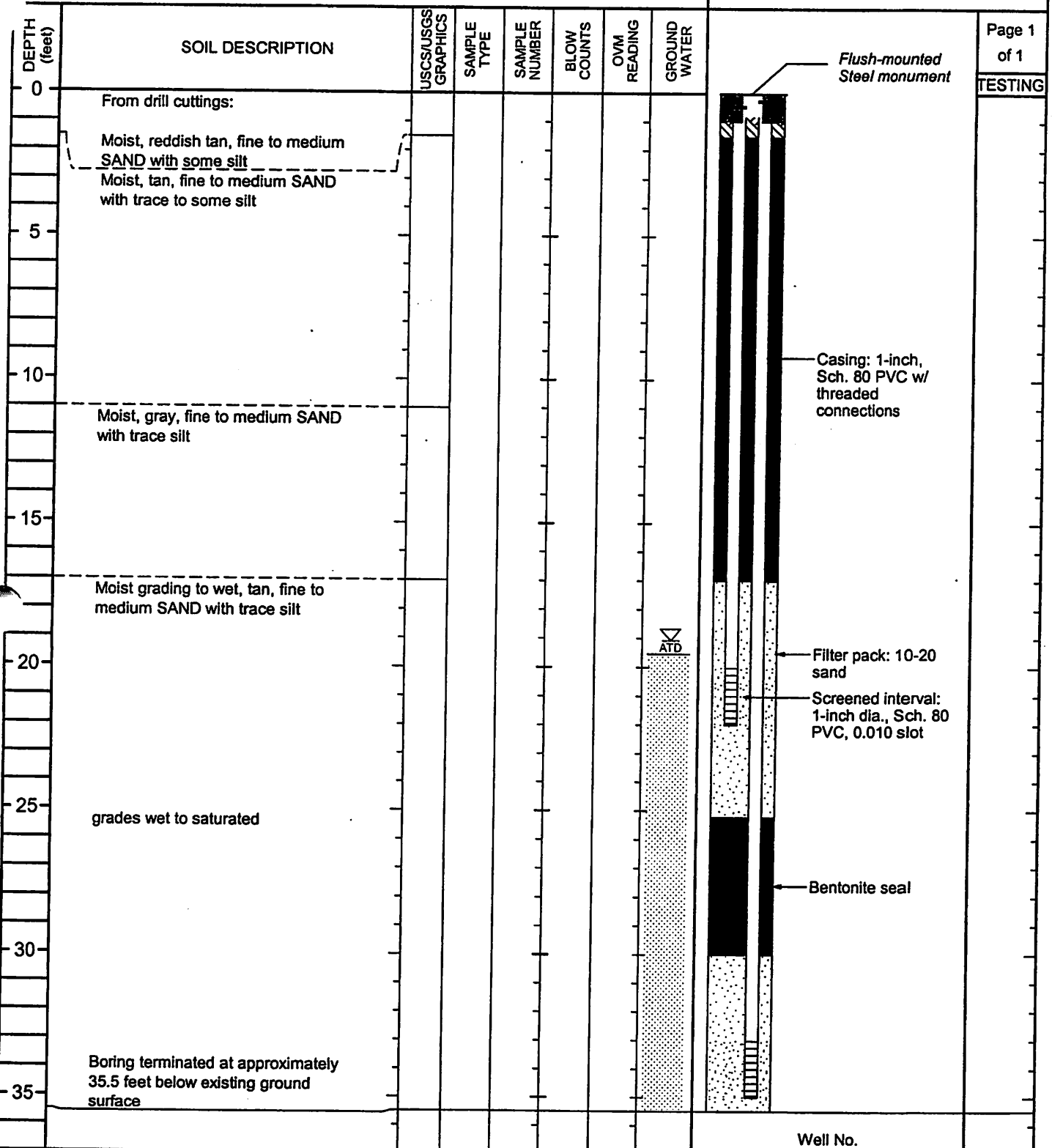
Elevation reference:

Well completed: November 14, 2001

AS-BUILT DESIGN

Ground surface elevation: 61.8 Feet

Casing elevation:



LEGEND

ATD Groundwater level at time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

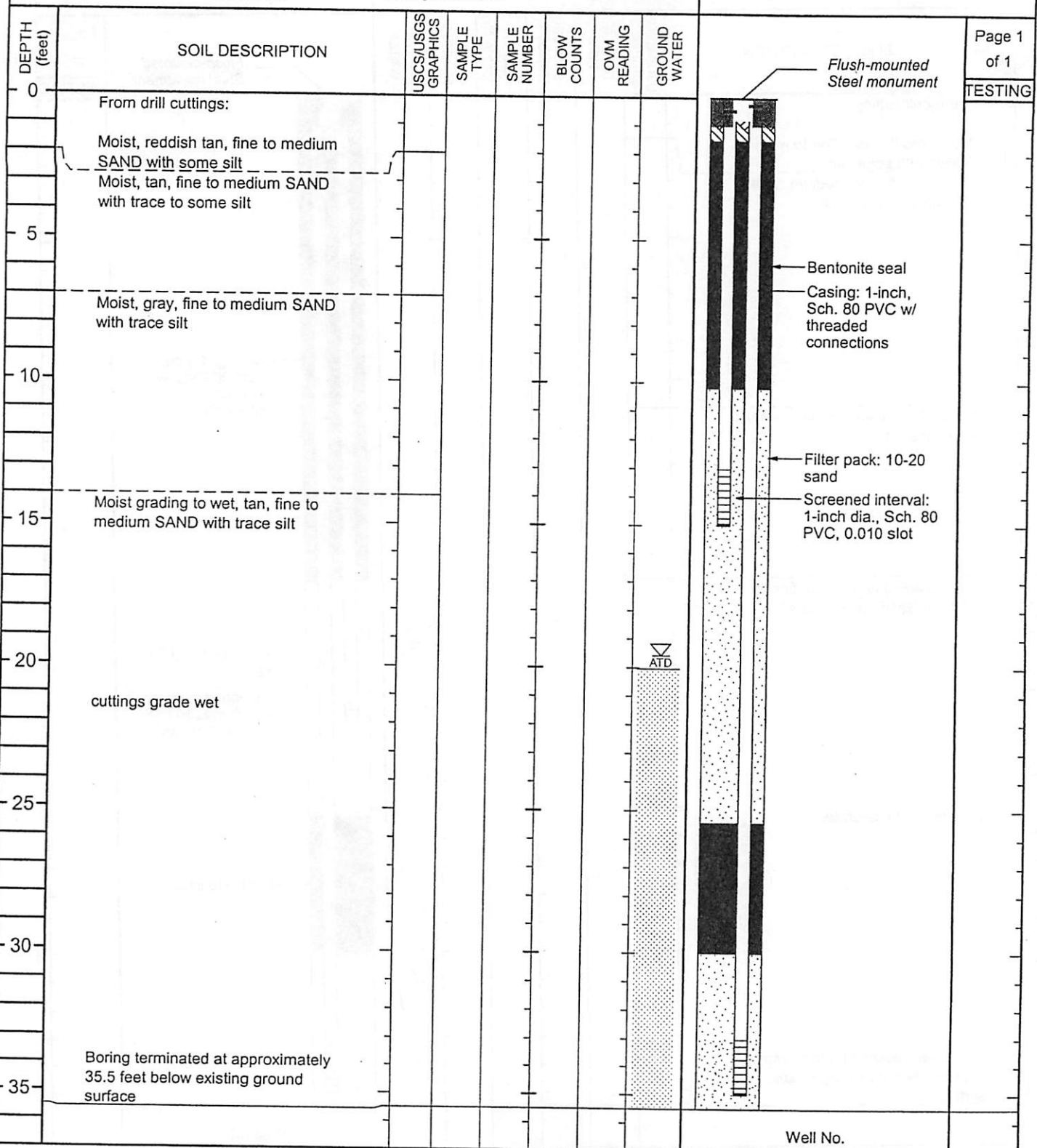
Elevation reference:

Well completed: November 13, 2001

Ground surface elevation: 61.99 Feet

Casing elevation:

AS-BUILT DESIGN

Page 1
of 1

TESTING


Flush-mounted
Steel monument

Bentonite seal

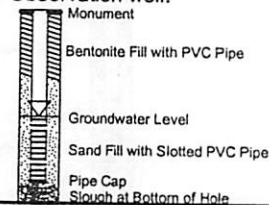
Casing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sandScreened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

ATD

LEGEND

 Groundwater level at
time of drilling

Observation well:



11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

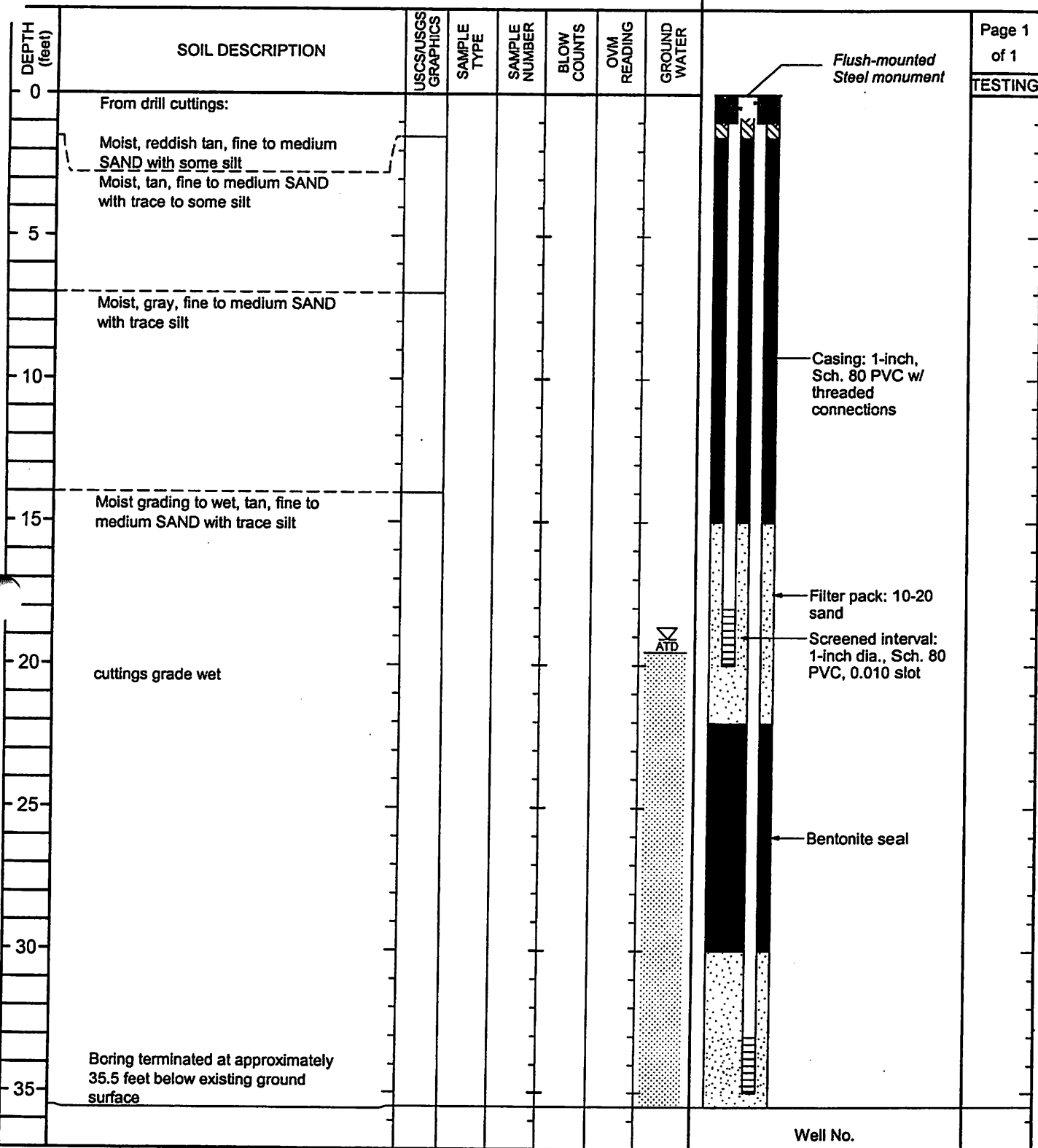
Elevation reference:

Well completed: November 13, 2001

Ground surface elevation: 62.48 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

Groundwater level at time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

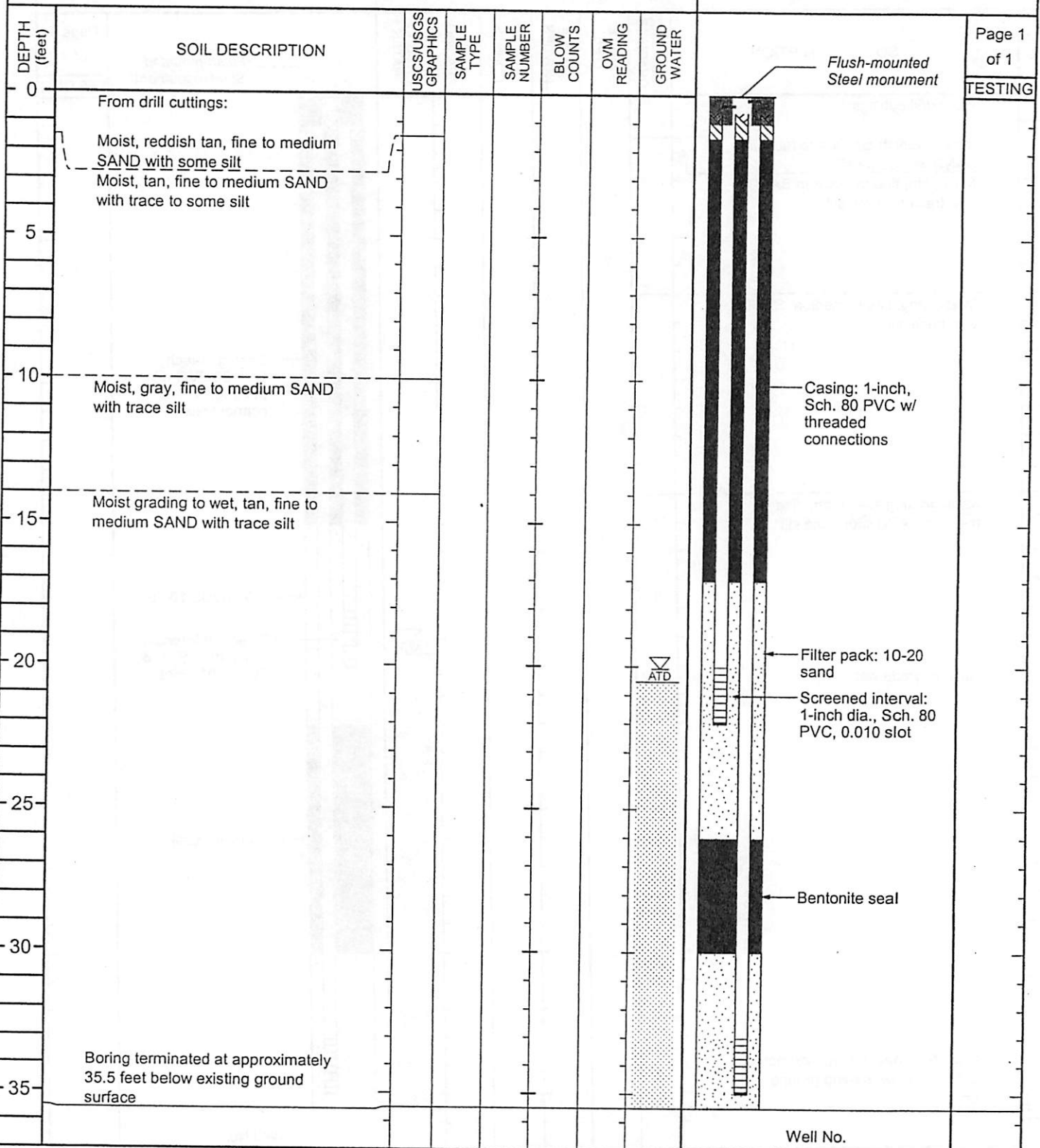
Elevation reference:

Well completed: November 13, 2001

Ground surface elevation: 62.4 Feet

Casing elevation:

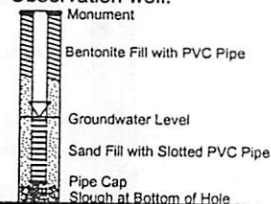
AS-BUILT DESIGN



LEGEND

ATD Groundwater level at time of drilling

Observation well:



amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

4IN1 IT-1/3.GPJ WA4IN1.GDT 3/15/02

Drilling started: November 13, 2001

Drilling completed: November 13, 2001

Logged By: WJL

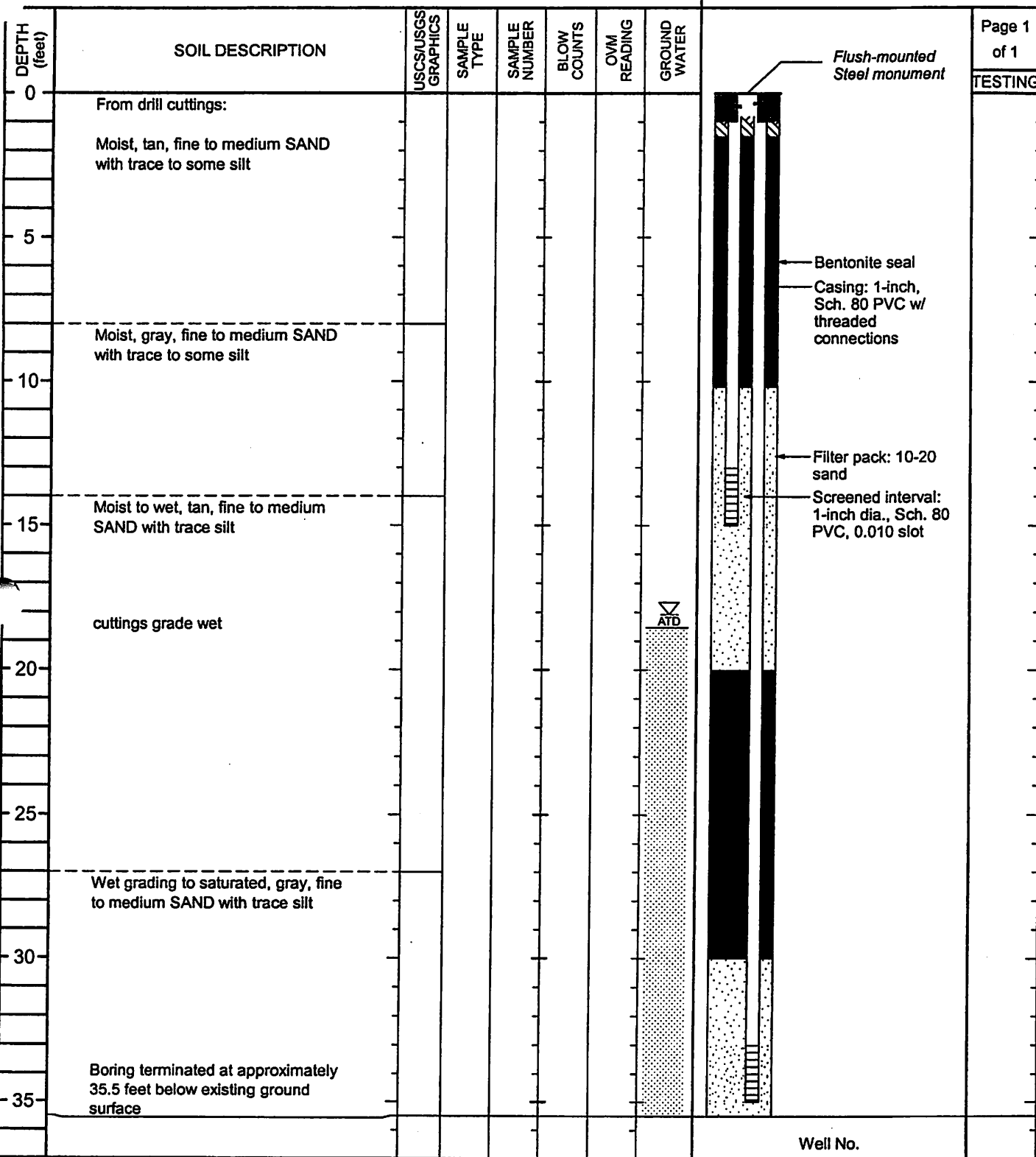
Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 51.74 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

 Groundwater level at
time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

 11335 N.E. 122nd Way Suite 100
 Kirkland, Washington 98034-6913

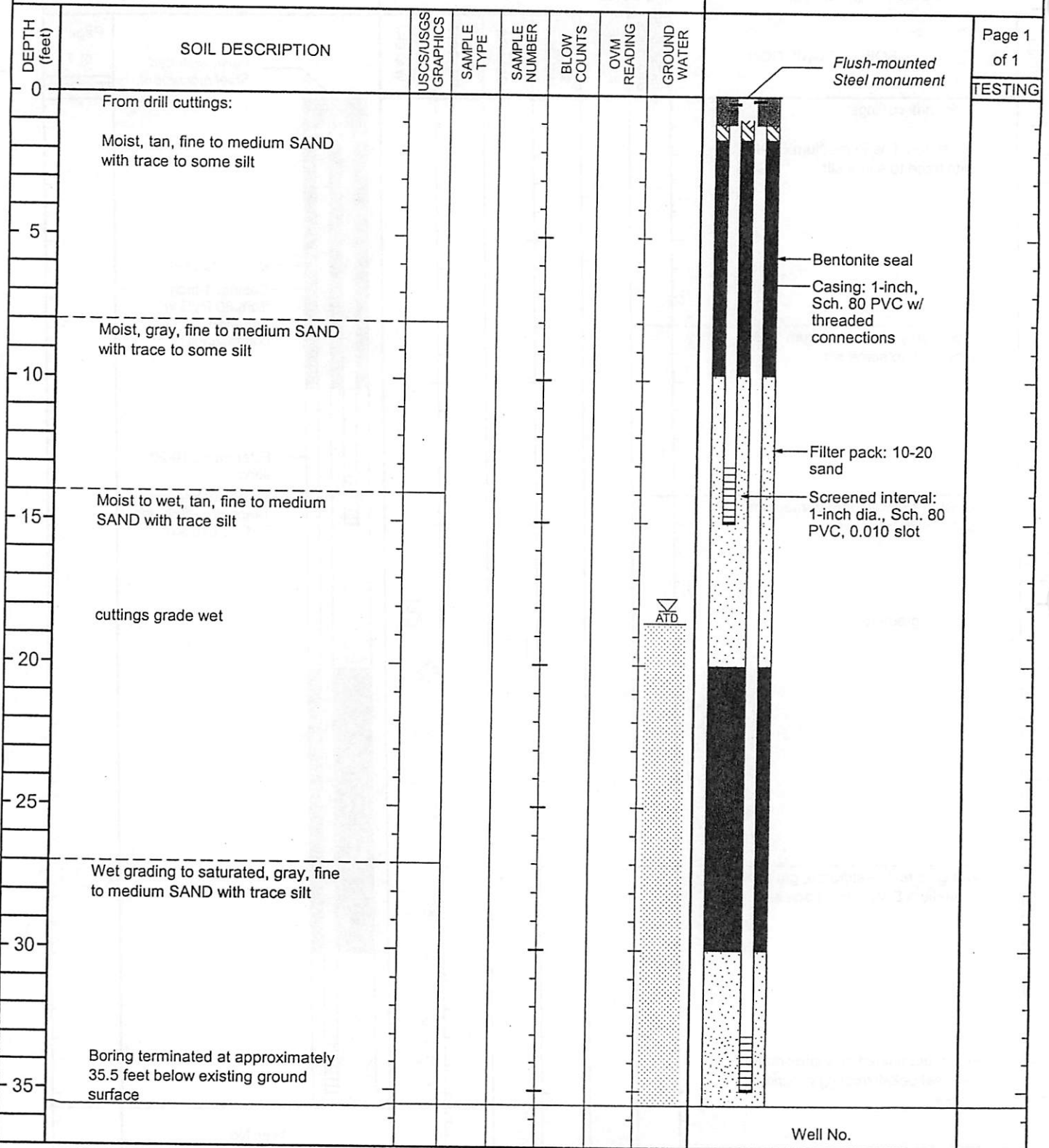
Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 51.81 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

 Groundwater level at
time of drillingObservation well:
Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

 Pipe Cap
Slough at Bottom of Hole11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

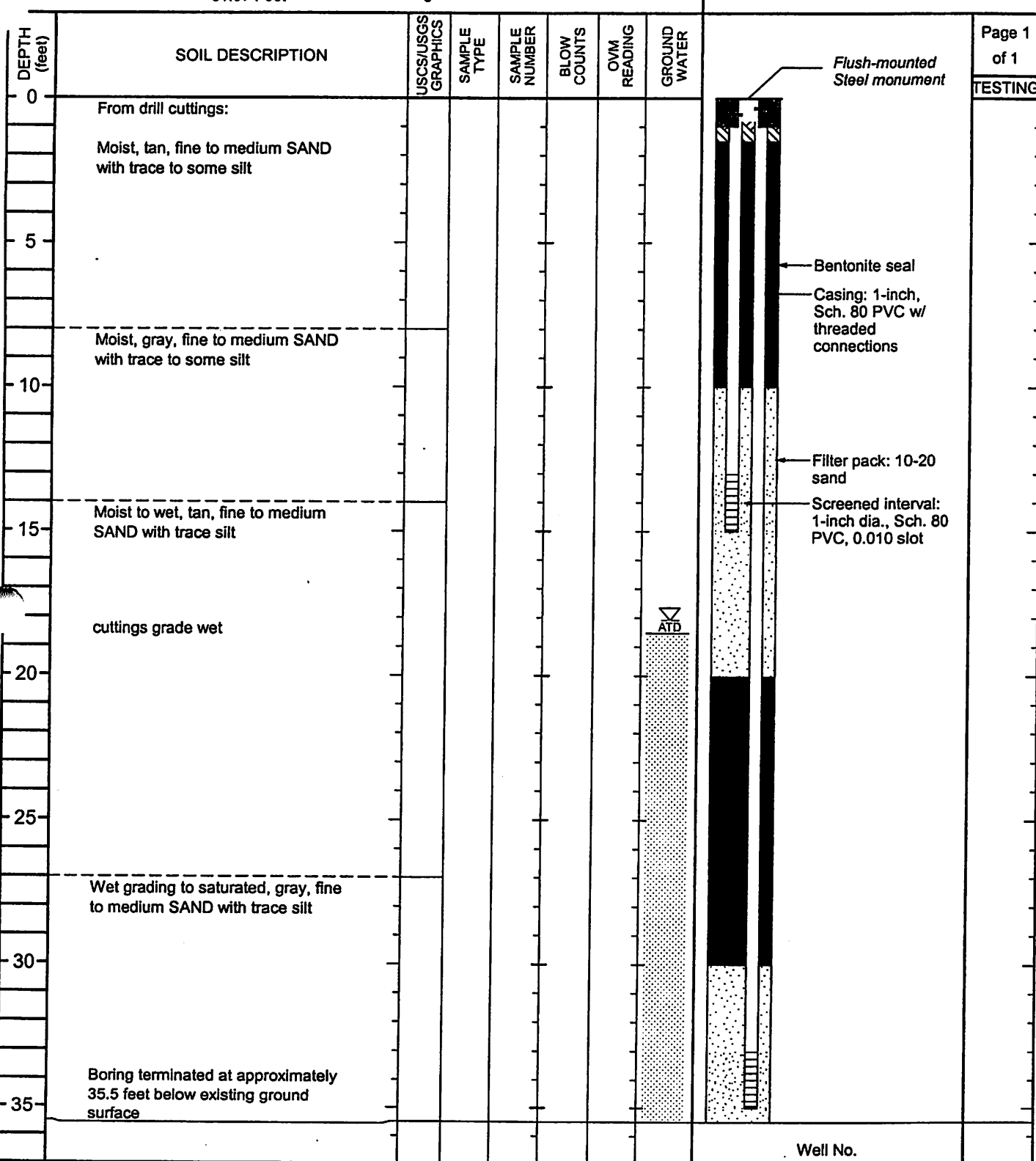
Elevation reference:

Well completed: November 13, 2001

Ground surface elevation: 51.97 Feet

Casing elevation:

AS-BUILT DESIGN


Page 1
of 1

TESTING

LEGEND

 Groundwater level at
time of drilling

Observation well:



Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 13, 2001

Drilling completed: November 13, 2001

Logged By: WJL

Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 51.68 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	Page 1 of 1
0	From drill cuttings: Moist, tan, fine to medium SAND with trace to some silt							TESTING
5								
10								
15	Moist to wet, light gray, fine to medium SAND with trace to some silt							
20	Wet, light gray, fine to medium SAND with trace silt (slightly more coarse than above) cuttings grade wetter cuttings grade saturated							
25								
30								
35	Boring terminated at approximately 35.5 feet below existing ground surface							

Flush-mounted
Steel monument



Bentonite seal


Casing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sandScreened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

ATD


Well No.

LEGEND

 Groundwater level at
time of drilling
Observation well:
Monument
 Bentonite Fill with PVC Pipe

 Groundwater Level

 Sand Fill with Slotted PVC Pipe

 Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 12, 2001

Drilling completed: November 12, 2001

Logged By: WJL

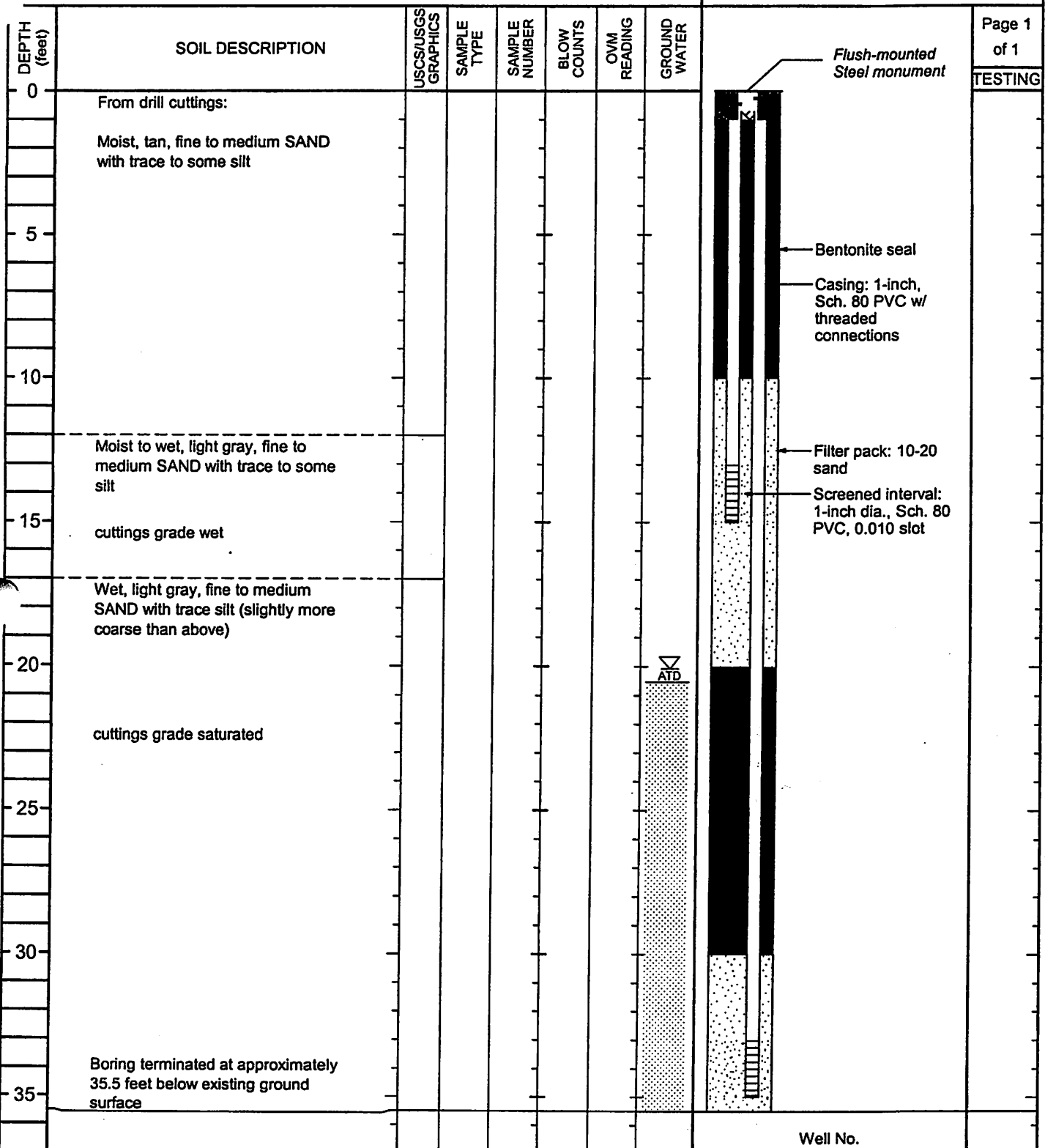
Elevation reference:

Well completed: November 12, 2001

Ground surface elevation: 51.66 Feet

Casing elevation:

AS-BUILT DESIGN

Page 1
of 1

TESTING

Flush-mounted
Steel monument

Bentonite seal

Casing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sandScreened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

ATD

LEGEND

Groundwater level at
time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

amec11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 12, 2001

Drilling completed: November 12, 2001

Logged By: WJL

Elevation reference:

Well completed: November 13, 2001

Ground surface elevation: 51.72 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OMV READING	GROUND WATER	TESTING
0	From drill cuttings: Moist, tan, fine to medium SAND with trace to some silt							
5								
10								
15	Moist to wet, light gray, fine to medium SAND with trace to some silt cuttings grade wet							
20	Wet, light gray, fine to medium SAND with trace silt (slightly more coarse than above) cuttings grade saturated							
25								
30								
35	Boring terminated at approximately 35.5 feet below existing ground surface							

Flush-mounted
Steel monument


Bentonite seal

Casing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sandScreened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

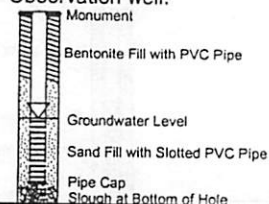
ATD

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:



11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 13, 2001

Drilling completed: November 13, 2001

Logged By: WJL

Elevation reference:

Well completed: November 09, 2001

Ground surface elevation: 51.33 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OM READING	GROUND WATER	TESTING
0	From drill cuttings: Roots and topsoil Moist, tan, silty, fine to medium SAND							
5	grades with trace to some silt							
10	Wet, tan, fine to medium SAND with some silt cuttings grade saturated							
15								
20	Saturated, gray, fine to medium SAND with some silt							
25								
30								
35	Boring terminated at approximately 35.5 feet below existing ground surface							
Well No.								

LEGEND

ATD Groundwater level at
time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

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11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 09, 2001

Drilling completed: November 09, 2001

Logged By: WJL

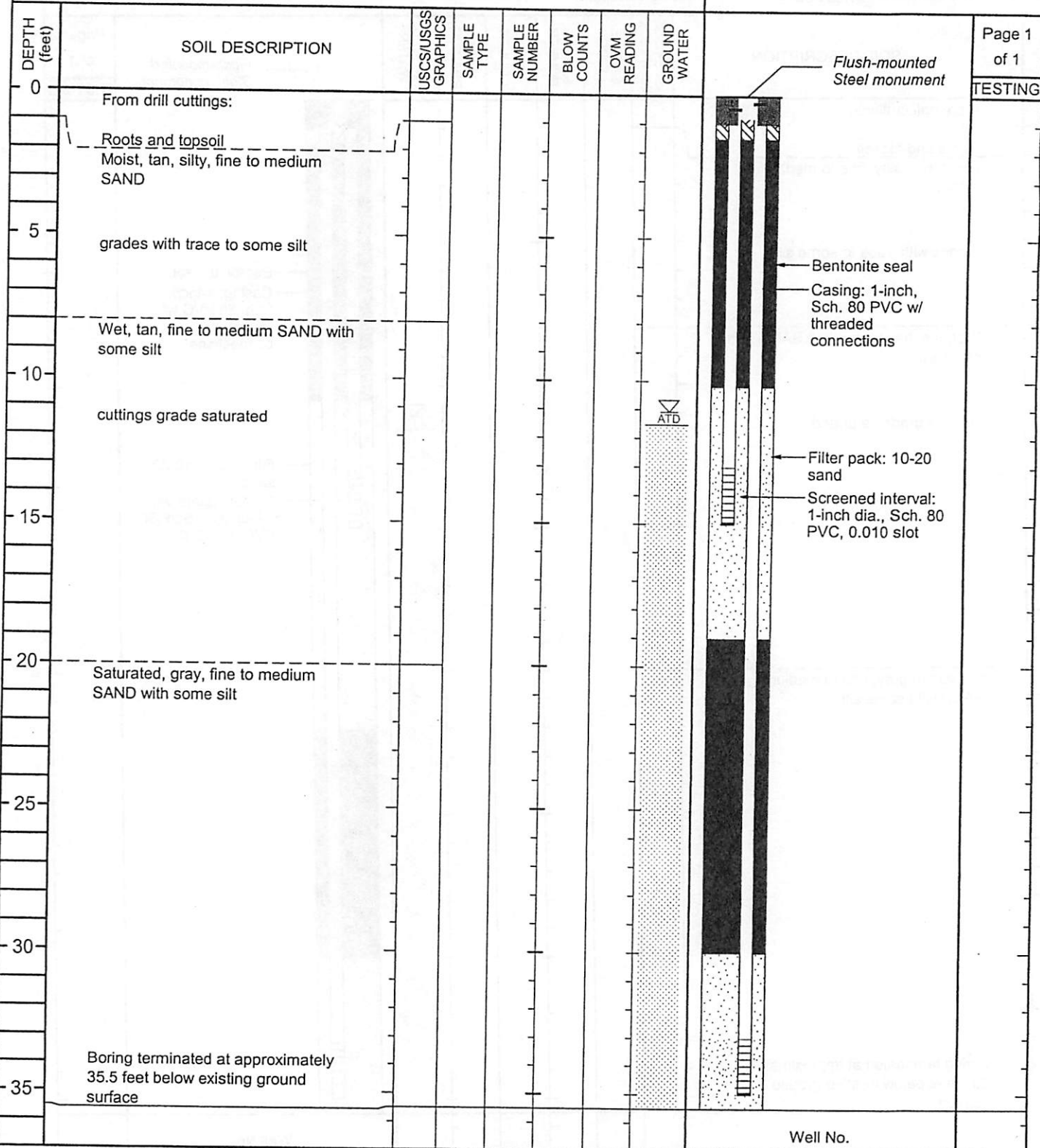
Elevation reference:

Well completed: November 09, 2001

Ground surface elevation: 51.72 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

▽ Groundwater level at time of drilling
ATD

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 09, 2001

Drilling completed: November 09, 2001

Logged By: WJL

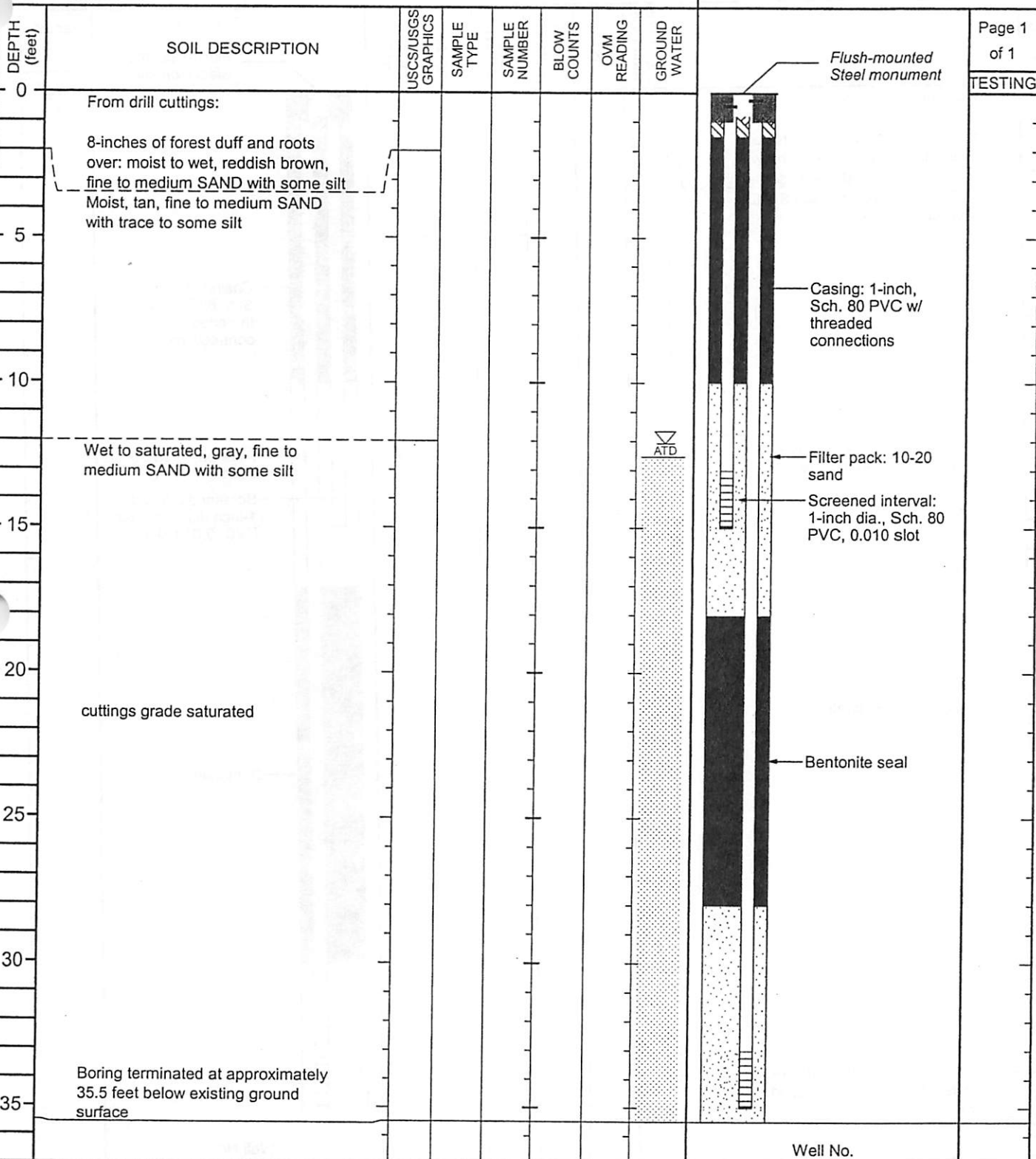
Elevation reference:

Well completed: November 08, 2001

Ground surface elevation: 51.25 Feet

Casing elevation:

AS-BUILT DESIGN


Page 1
of 1

TESTING







Flush-mounted
Steel monumentCasing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sandScreened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

Bentonite seal

LEGEND

 Groundwater level at
time of drilling

Observation well:

 Monument
 Bentonite Fill with PVC Pipe
 Groundwater Level
 Sand Fill with Slotted PVC Pipe
 Pipe Cap
 Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

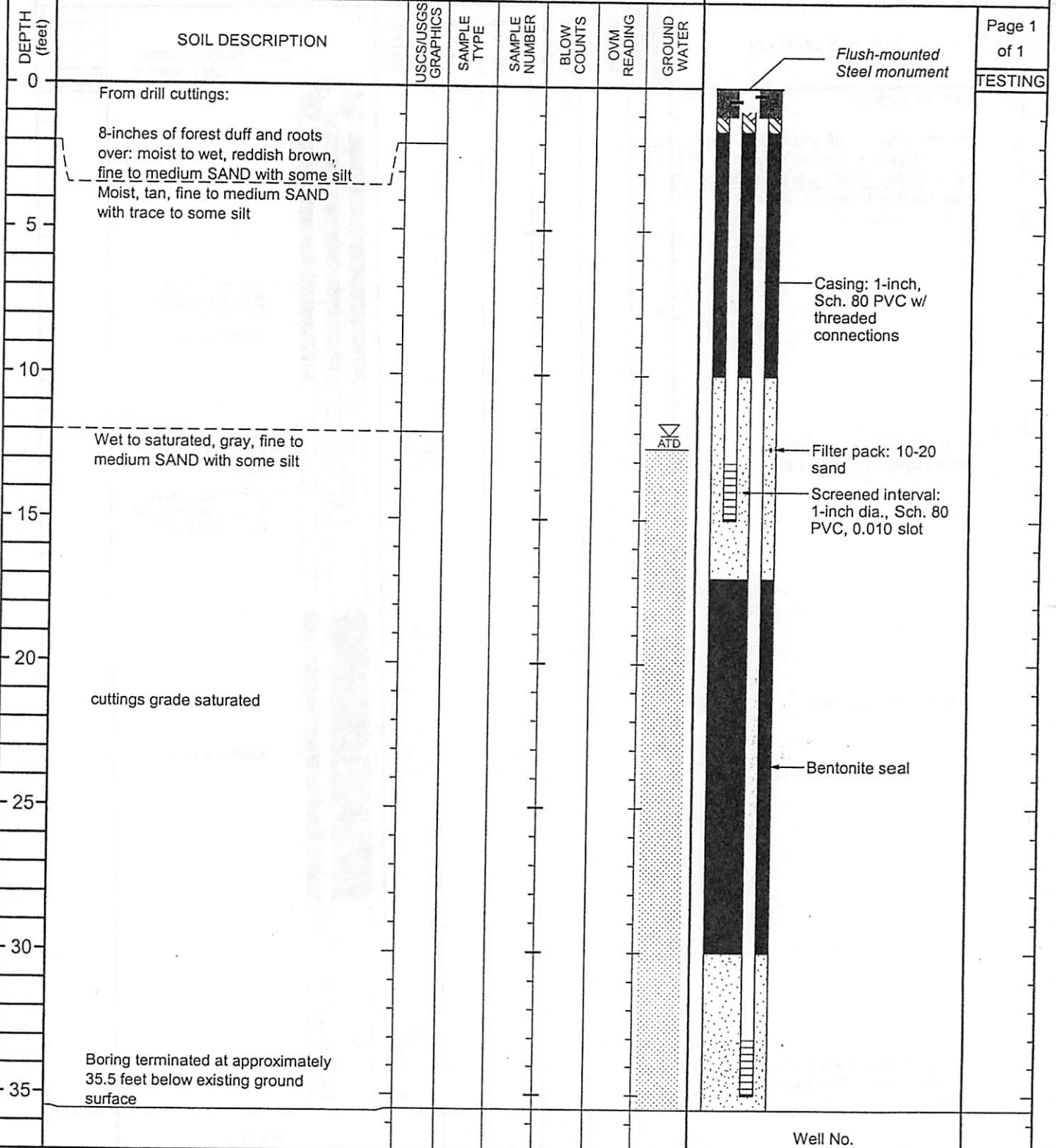
Elevation reference:

Well completed: November 09, 2001

Ground surface elevation: 51.66 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

ATD Groundwater level at time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

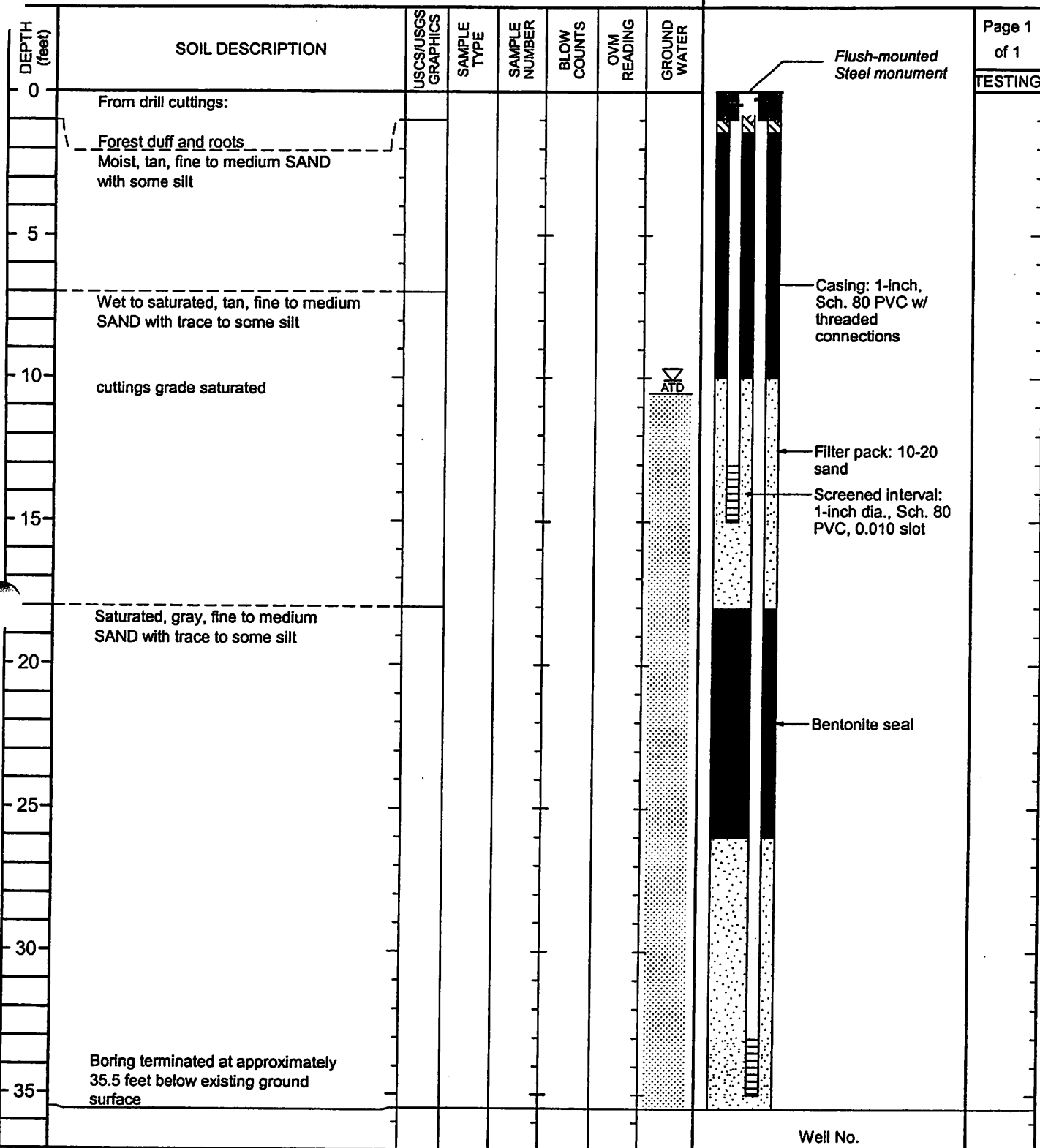
Elevation reference:

Well completed: November 08, 2001

Ground surface elevation: 51.16 Feet

Casing elevation:

AS-BUILT DESIGN



LEGEND

ATD Groundwater level at time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Elevation reference:

Well completed: December 07, 2001

Ground surface elevation:

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OMV READING	GROUND WATER	TESTING
0	From drill cuttings:							
	Moist to wet, brown, silty fine to medium SAND with moderate organics (Topsoil and Forest Duff)							
5	Moist to wet, tan, fine to medium SAND with some silt							
	Saturated, tan, fine to medium SAND with trace silt							
10	cuttings grade saturated							
15	Saturated, tan, fine to medium SAND with trace to some silt							
20								
25	Boring terminated at approximately 22.5 feet below existing ground surface							
30								
35								

Flush-mounted
Steel monumentCasing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sand
Screened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

Bentonite seal

Well No.

LEGEND

 Groundwater level at
time of drilling
Observation well:
Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap
Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: December 07, 2001

Drilling completed: December 07, 2001

Logged By: WJL

Elevation reference:

Well completed: December 07, 2001

Ground surface elevation:

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	From drill cuttings:							
	Moist to wet, brown, silty fine to medium SAND with moderate organics (Topsoil and Forest Duff)							
5	Moist to wet, reddish tan, fine to medium SAND with some silt							
	Wet, tan, fine to medium SAND with trace silt							
	cuttings grade saturated							
10								
	Saturated, tan, fine to medium SAND with some silt/ silty fine to medium SAND							
15								
	Saturated, gray, fine to medium SAND with trace to some silt							
20								
	Boring terminated at approximately 22.5 feet below existing ground surface							
25								
30								
35								

Flush-mounted
Steel monumentCasing: 1-inch,
Sch. 80 PVC w/
threaded
connectionsFilter pack: 10-20
sand
Screened interval:
1-inch dia., Sch. 80
PVC, 0.010 slot

Bentonite seal

Well No.

LEGEND

Groundwater level at
time of drilling

Observation well:

Monument

Bentonite Fill with PVC Pipe

Groundwater Level

Sand Fill with Slotted PVC Pipe

Pipe Cap

Slough at Bottom of Hole

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: December 07, 2001

Drilling completed: December 07, 2001

Logged By: WJL

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 54.95 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER		Page 1 of 1
0	Logged from cuttings (no samples obtained)								TESTING
	Brown to reddish tan, fine to medium SAND with trace to some silt								
5	Moist, tan, fine to medium SAND with trace silt								
	Moist, light gray, fine to medium SAND with trace silt and gravel								
10									
15									
	grades wet								
20									
	Boring terminated at approximately 20.5 feet below existing ground surface								
25									

Flush-mounted
Steel monumentCasing: Sch 40
PVC w/ threaded
connectionsFilter pack: 10-20
Sand
Screened interval:
2-inch diameter,
sch 40, PVC, 0.010
slot


ATD

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:

 Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 07, 2001

Drilling completed: November 07, 2001

Logged By: WJL

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 51.66 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	Logged from cuttings (no samples obtained)							
	Brown to reddish tan, fine to medium SAND with trace to some silt							
5	Moist, tan, fine to medium SAND with trace silt							
	Moist, light gray, fine to medium SAND with trace silt and gravel							
10	grades wet to saturated							
15								
20								
25	Boring terminated at approximately 20.5 feet below existing ground surface							

Flush-mounted Steel monument


Casing: Sch 40 PVC w/ threaded connections

Filter pack: 10-20 Sand







Screened interval: 2-inch diameter, sch 40, PVC, 0.010 slot

Well No.

LEGEND

 Groundwater level at time of drilling

Observation well:

 Monument
 Bentonite Fill with PVC Pipe
 Groundwater Level
 Sand Fill with Slotted PVC Pipe
 Pipe Cap
 Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 63.3 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	Logged from cuttings (no samples obtained)							
5	Brown to reddish tan, silty, fine to medium SAND grading to reddish brown fine to medium SAND with trace to some silt							
10	Moist, tan, fine to medium SAND with trace silt							
15	Wet grading to saturated, light gray/tan, fine to medium SAND with trace silt							
20	Boring terminated at approximately 20.5 feet below existing ground surface							
25								

Flush-mounted
Steel monumentCasing: Sch 40
PVC w/ threaded
connectionsFilter pack: 10-20
SandScreened interval:
2-inch diameter,
sch 40, PVC, 0.010
slot


ATD

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:



Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 07, 2001

Drilling completed: November 07, 2001

Logged By: WJL

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 52.05 Feet

Casing elevation:


AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	Logged from cuttings (no samples obtained)							
	Forest duff over topsoil Moist, reddish brown, fine to medium SAND with some silt							
	Moist, tan, fine to medium SAND with trace silt							
5	grades wet							
10	Wet to saturated, light gray, fine to medium SAND with trace silt and gravel							
15	grades olive gray with trace to some silt							
20	Boring terminated at approximately 20.5 feet below existing ground surface							
25								


Flush-mounted
Steel monumentCasing: Sch 40
PVC w/ threaded
connectionsFilter pack: 10-20
SandScreened interval:
2-inch diameter,
sch 40, PVC, 0.010
slot

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:



Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 07, 2001

Drilling completed: November 07, 2001

Logged By: WJL

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 47.94 Feet

Casing elevation:


AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	Logged from cuttings (no samples obtained)							
	4-inches black, gravelly, silty SAND (FILL) over:							
	Brown to reddish tan, fine to medium SAND with trace to some silt							
5	Moist, tan, fine to medium SAND with trace to some silt							
	grades wet							
10								
	Saturated, gray, fine to medium SAND with trace silt							
15								
20								
	Boring terminated at approximately 20.5 feet below existing ground surface							
25								







Flush-mounted
Steel monumentCasing: Sch 40
PVC w/ threaded
connectionsFilter pack: 10-20
SandScreened interval:
2-inch diameter,
sch 40, PVC, 0.010
slot

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:

 Monument
 Bentonite Fill with PVC Pipe
 Groundwater Level
 Sand Fill with Slotted PVC Pipe
 Pipe Cap
 Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 07, 2001

Drilling completed: November 07, 2001

Logged By: WJL

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 53.37 Feet

Casing elevation:

AS-BUILT DESIGN


DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	QVM READING	GROUND WATER	TESTING
0	Logged from cuttings (no samples obtained)							
5	Forest duff over: moist to wet, tan, fine to medium SAND with some silt							
10	Wet, light tan/gray, fine to medium SAND with trace to some silt							
15	Saturated, gray, fine to medium SAND with trace silt							
20	Boring terminated at approximately 20.5 feet below existing ground surface							
25								

Flush-mounted
Steel monumentCasing: Sch 40
PVC w/ threaded
connectionsFilter pack: 10-20
SandScreened interval:
2-inch diameter,
sch 40, PVC, 0.010
slot


ATD

Well No.

LEGEND

 Groundwater level at
time of drilling

Observation well:

 Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole


11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

Logged By: WJL

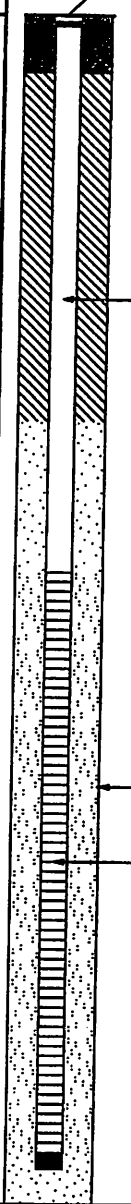
Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 49.57 Feet

Casing elevation:


AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER		Page 1 of 1
0	Logged from cuttings (no samples obtained)								TESTING
	Wet, dark brown/black WOOD DEBRIS within a silty fine to medium SAND matrix (FILL)								
5	Wet, mottled gray/tan, fine to medium SAND with some silt								
	Wet, gray, fine to medium SAND with some silt								
10									
	grades saturated								
15									
20									
	Boring terminated at approximately 20.5 feet below existing ground surface								
25									

LEGEND

 Groundwater level at time of drilling

Observation well:



Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

amec11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

Logged By: WJL

Elevation reference:

Well completed: November 07, 2001

Ground surface elevation: 54.18 Feet

Casing elevation:

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	USCS/USGS GRAPHICS	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER		Page 1 of 1
0	Logged from cuttings (no samples obtained)							Flush-mounted Steel monument	TESTING
5	Forest duff (6-inches) over: wet, tan, silty, fine to medium SAND							Casing: Sch 40 PVC w/ threaded connections	
10	Wet, to saturated, gray, fine to medium SAND with some silt						ATD	Filter pack: 10-20 Sand	
15	grades saturated							Screened interval: 2-inch diameter, sch 40, PVC, 0.010 slot	
20	Boring terminated at approximately 20.5 feet below existing ground surface							Well No.	
25									

LEGEND

ATD Groundwater level at time of drilling

Observation well:

Monument
Bentonite Fill with PVC Pipe
Groundwater Level
Sand Fill with Slotted PVC Pipe
Pipe Cap
Slough at Bottom of Hole

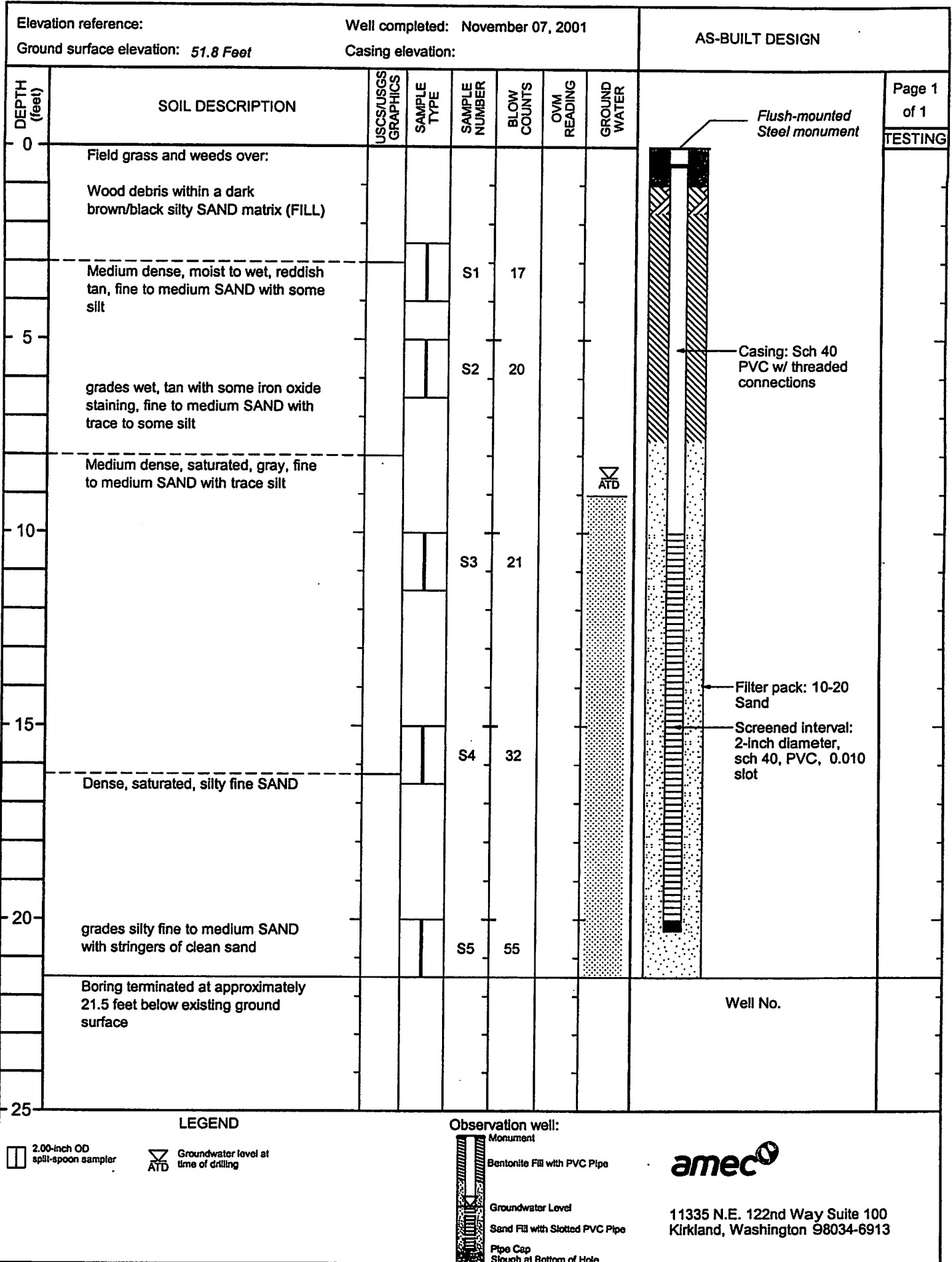
amec

11335 N.E. 122nd Way Suite 100
Kirkland, Washington 98034-6913

Drilling started: November 08, 2001

Drilling completed: November 08, 2001

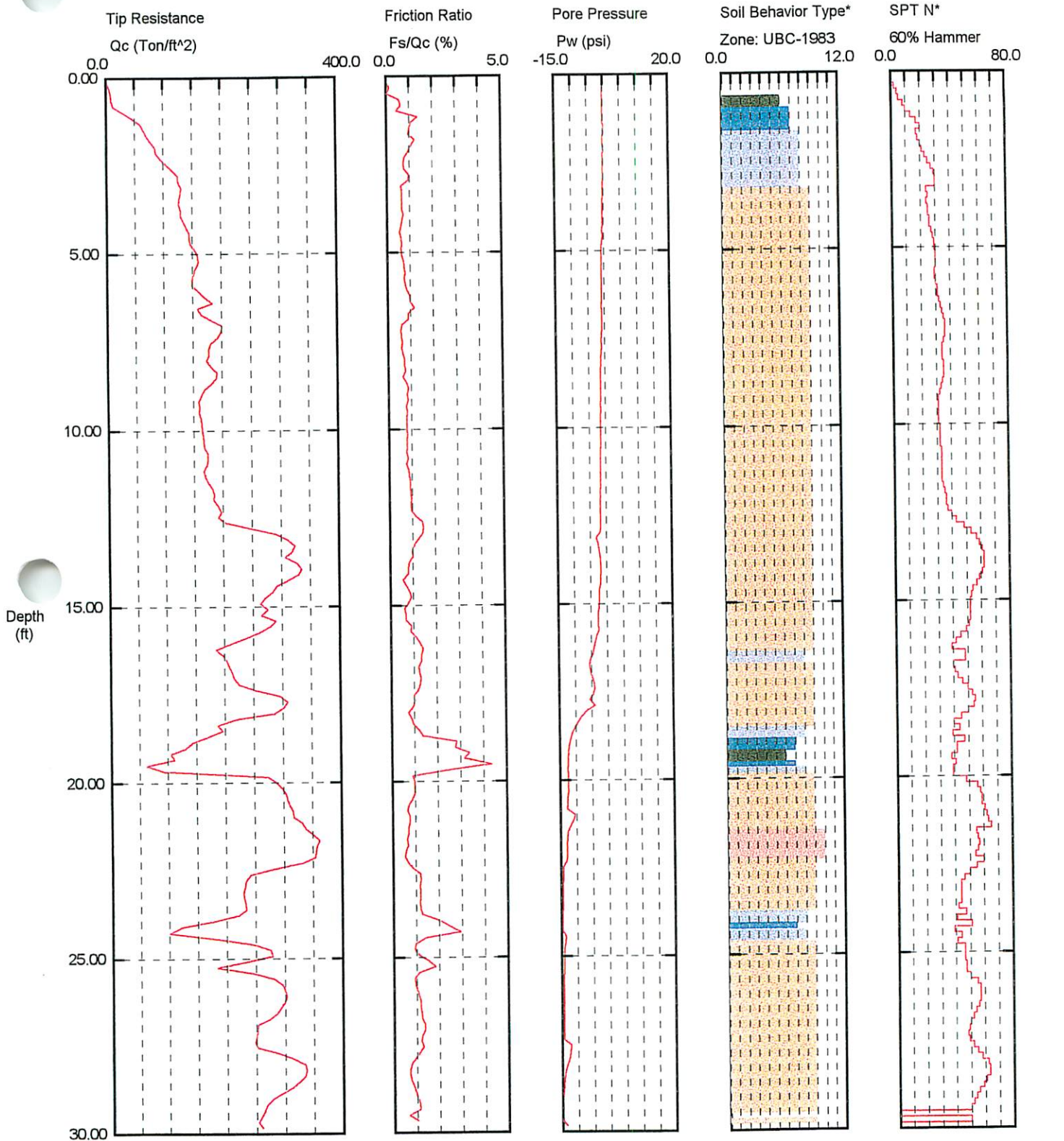
Logged By: WJL



AMECE & E

Operator: BROWN
Sounding: 1001
Cone Used: 581

CPT Date/Time: 02-19-02 09:42
Location: Tulalip Casino Dewatering Review
Job Number: 291M13845B



Maximum Depth = 30.02 feet

Depth Increment = 0.16 feet

- | | | | |
|--------------------------|-----------------------------|----------------------------|--------------------------------|
| 1 sensitive fine grained | 4 silty clay to clay | 7 silty sand to sandy silt | 10 gravelly sand to sand |
| 2 organic material | 5 clayey silt to silty clay | 8 sand to silty sand | 11 very stiff fine grained (*) |
| 3 clay | 6 sandy silt to clayey silt | 9 sand | 12 sand to clayey sand (*) |

Northwest Cone Exploration Inc.

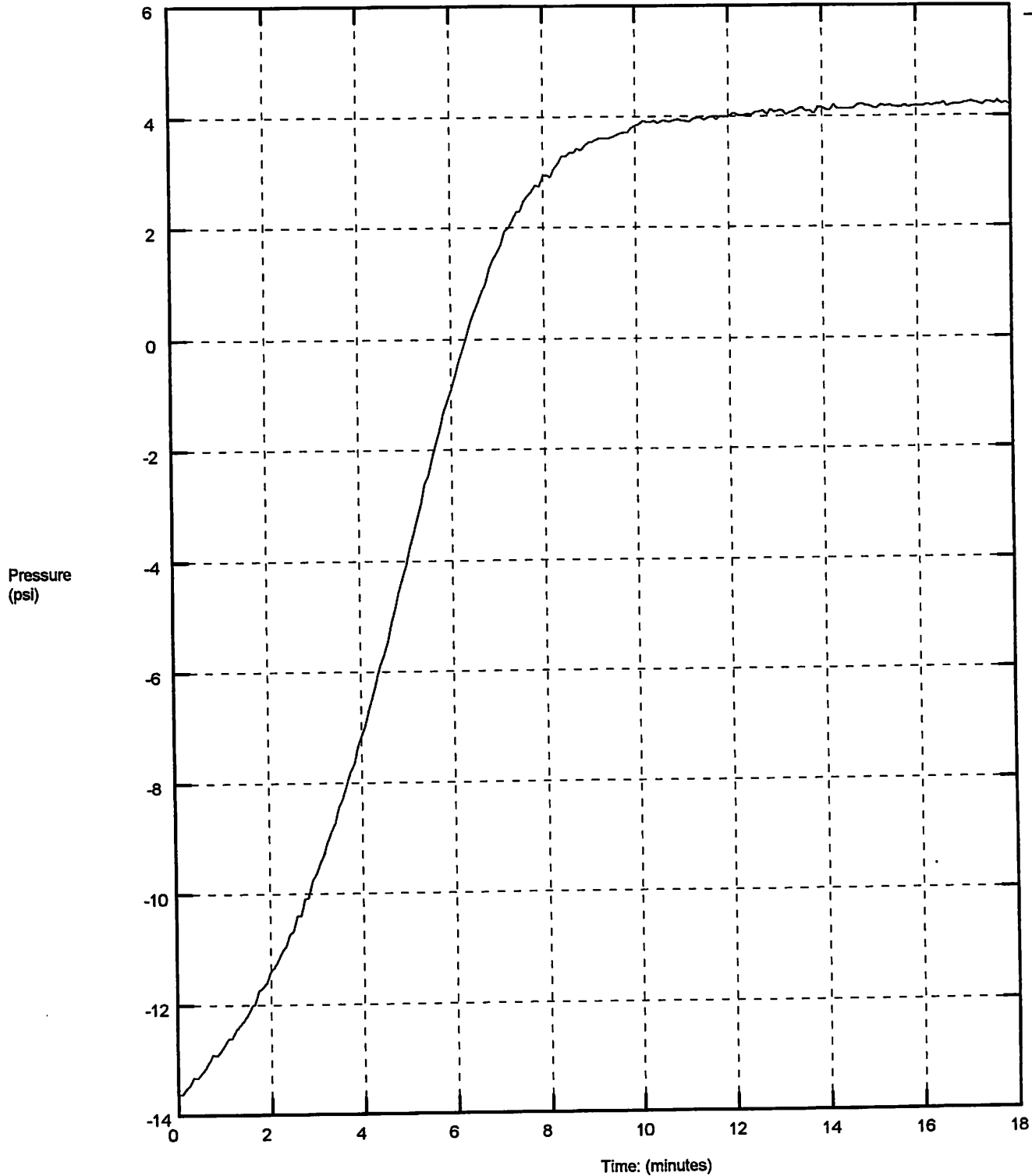
AMEC E & E

Operator BROWN
Sounding: CPT-28
Cone Used: 581

CPT Date/Time: 02-19-82 09:42
Location: 1001
Job Number: TULALIP

Selected Depth(s)
(feet)

—30.02



Maximum Pressure = 4.272 psi
Hydrostatic Pressure = 13.029 psi

AMECE & E

Operator: BROWN

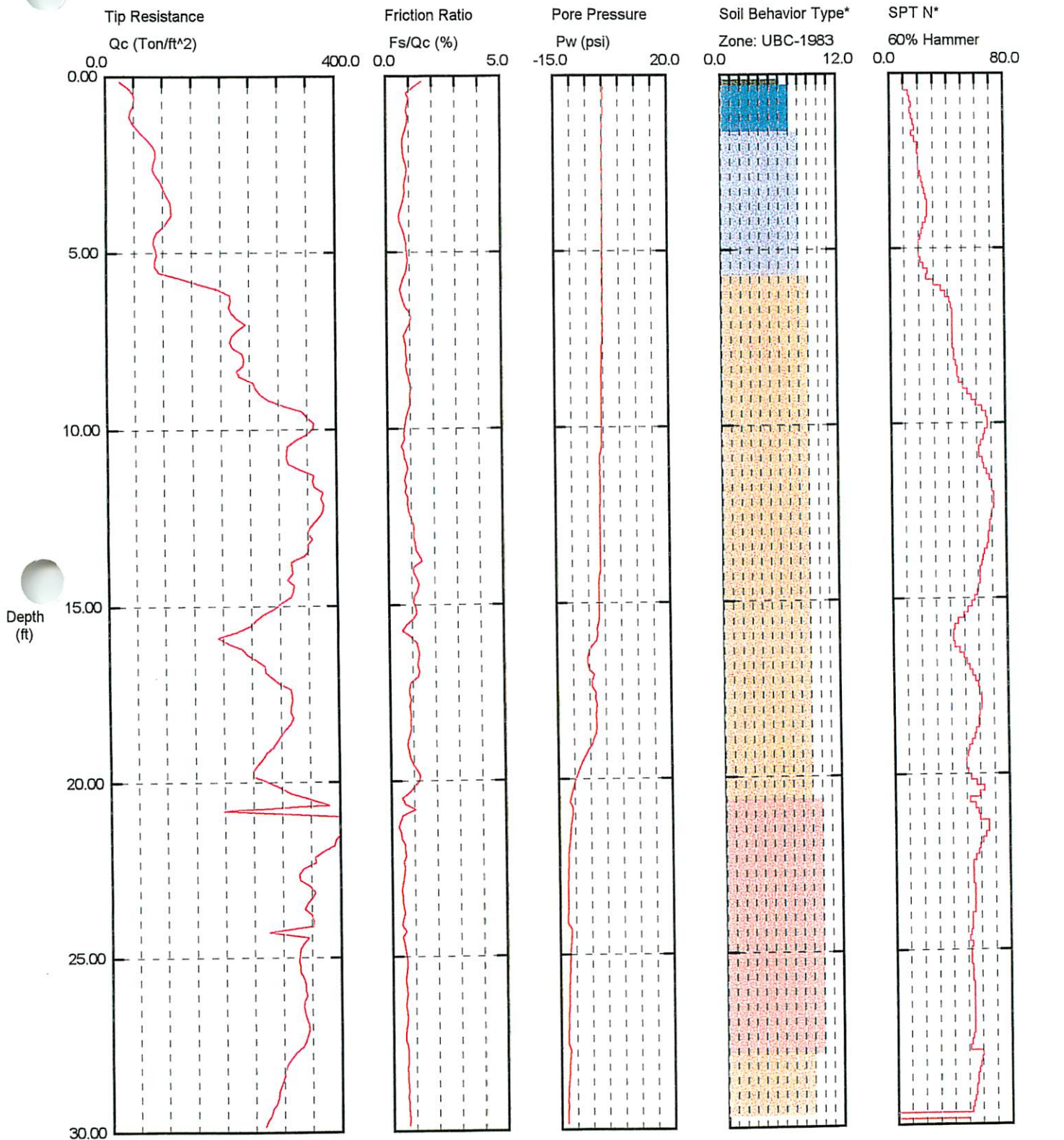
Sounding: 1002

Cone Used: 581

CPT Date/Time: 02-19-02 10:41

Location: Tulalip Casino Dewatering Review

Job Number: 291M13845B



Maximum Depth = 30.18 feet

Depth Increment = 0.16 feet

- | | | | |
|--------------------------|-----------------------------|----------------------------|--------------------------------|
| 1 sensitive fine grained | 4 silty clay to clay | 7 silty sand to sandy silt | 10 gravelly sand to sand |
| 2 organic material | 5 clayey silt to silty clay | 8 sand to silty sand | 11 very stiff fine grained (*) |
| 3 clay | 6 sandy silt to clayey silt | 9 sand | 12 sand to clayey sand (*) |

Northwest Cone Exploration Inc.

AMEC E & E

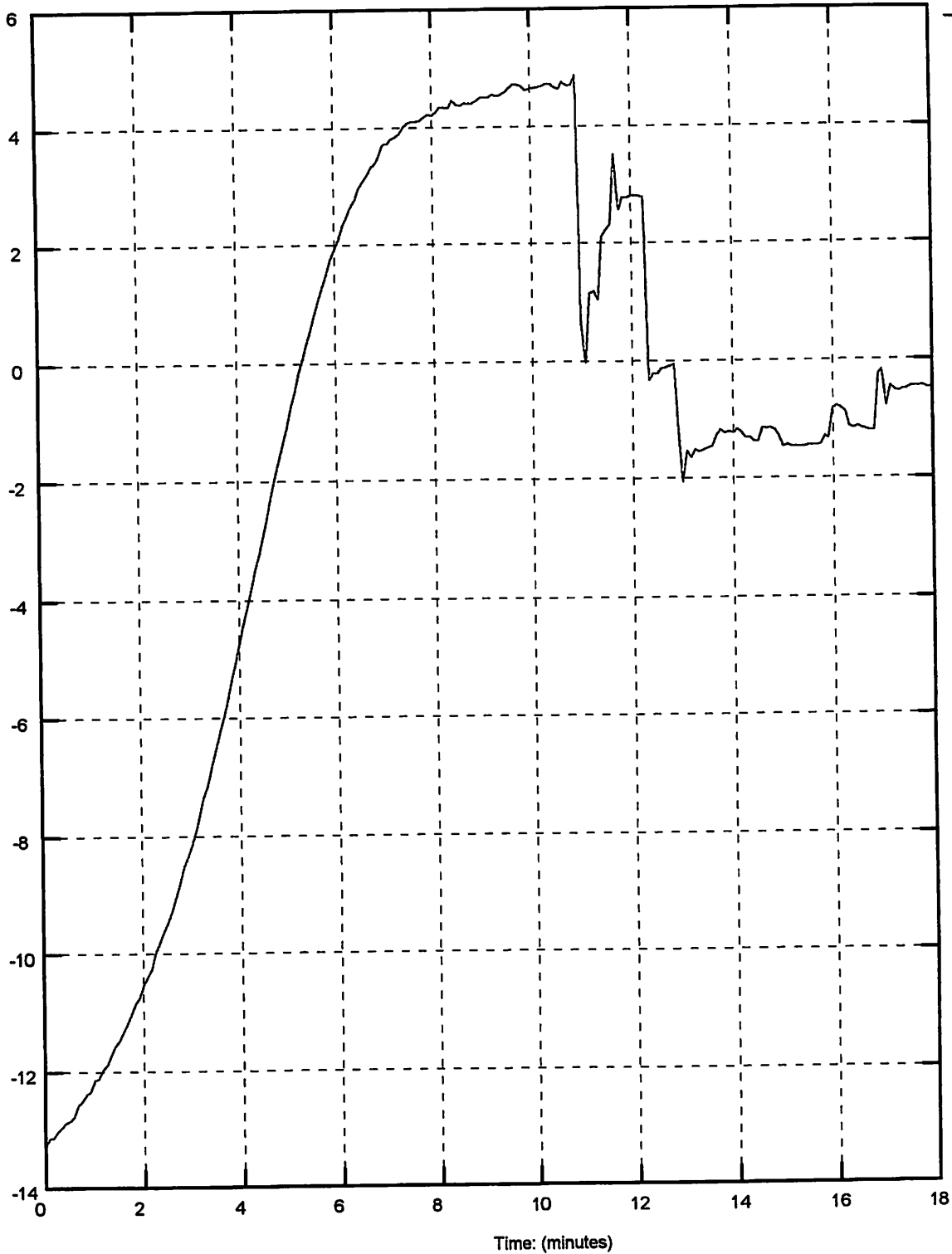
Operator BROWN
Sounding: CPT-29
Cone Used: 581

CPT Date/Time: 02-19-82 10:41
Location: 1002
Job Number: TULALIP

Selected Depth(s)
(feet)

—30.184

Pressure
(psi)

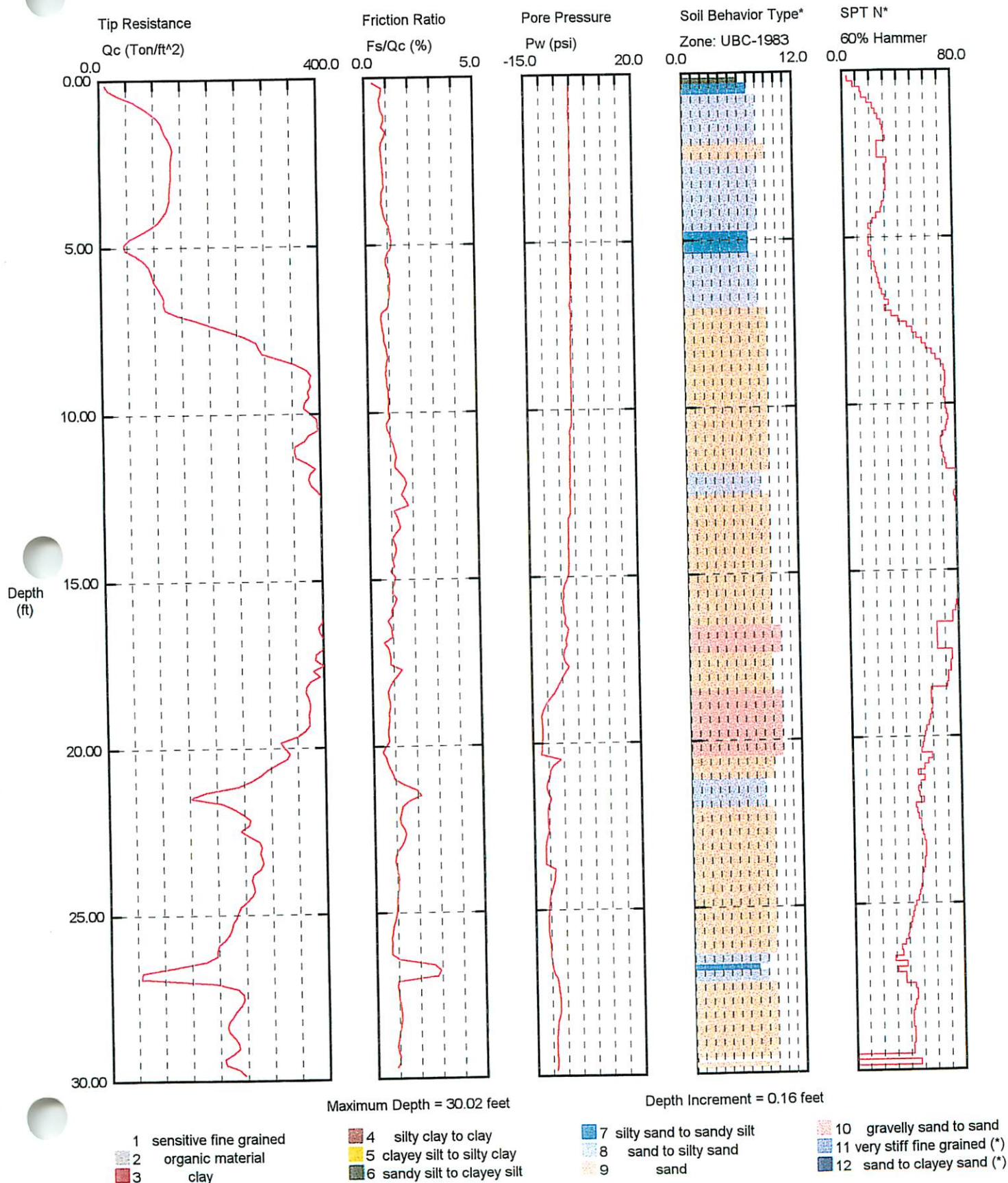


Maximum Pressure = 4.862 psi
Hydrostatic Pressure = 13.1 psi

AMEC E & E

Operator: BROWN
Sounding: 1003
Cone Used: 581

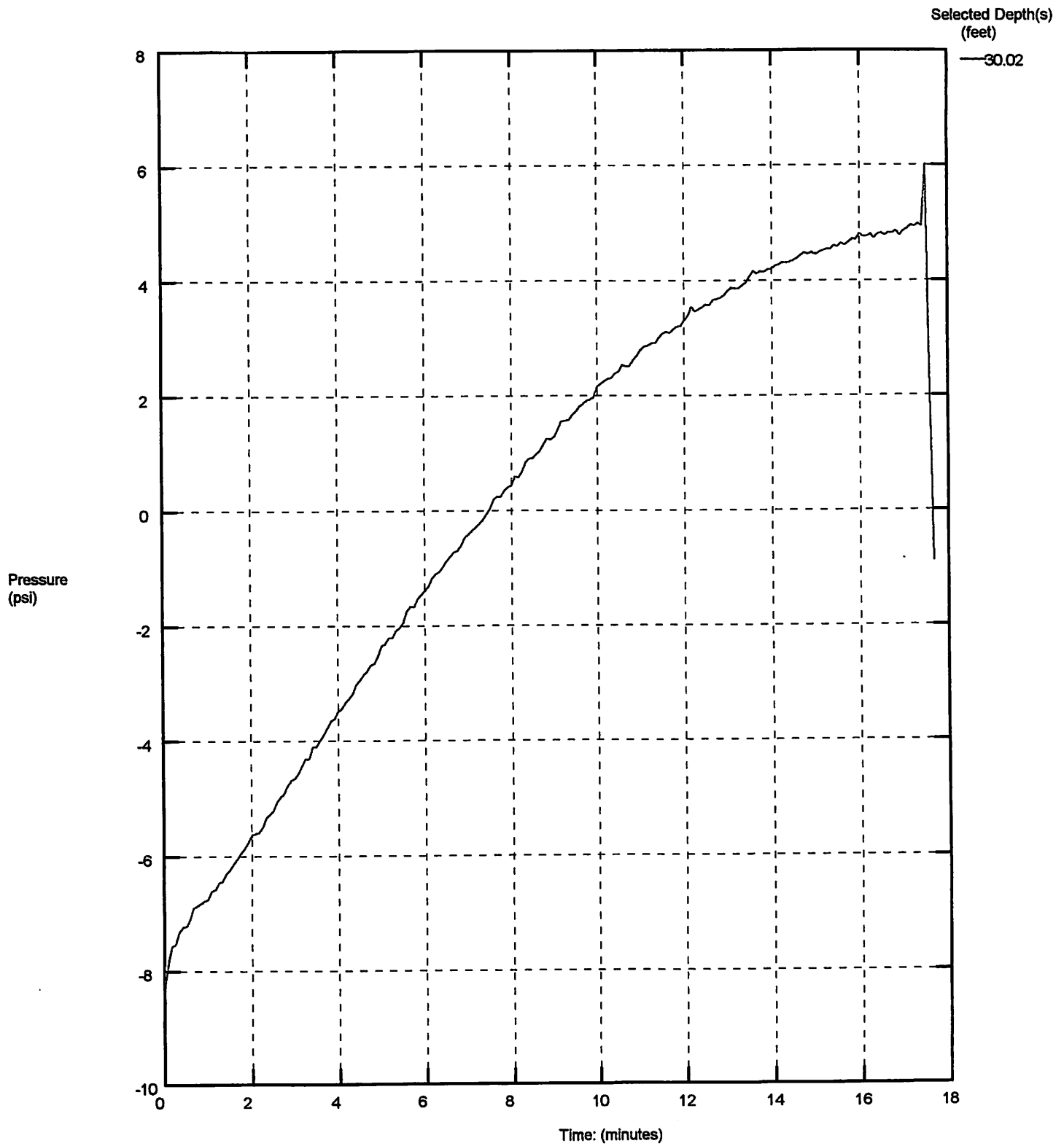
CPT Date/Time: 02-19-02 11:19
Location: Tulalip Casino Dewatering Review
Job Number: 291M13845B



AMEC E & E

Operator BROWN
Sounding: CPT-30
Cone Used: 581

CPT Date/Time: 02-19-82 11:19
Location: 1003
Job Number: TULALIP

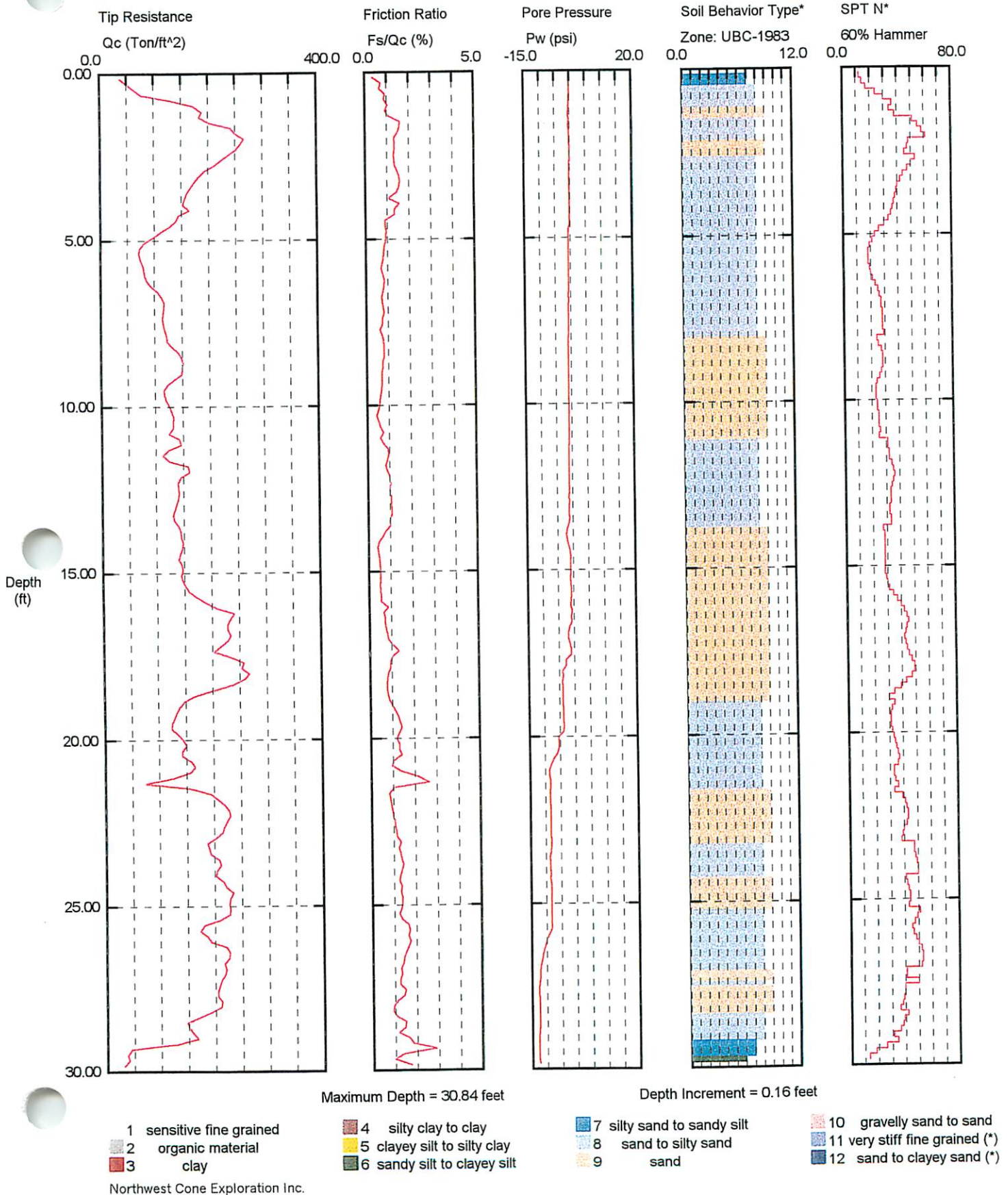


Maximum Pressure = 6.002 psi
Hydrostatic Pressure = 13.029 psi

AMEC E & E

Operator: BROWN
Sounding: 1004
Cone Used: 581

CPT Date/Time: 02-19-02 12:14
Location: Tulalip Casino Dewatering Review
Job Number: 291M13845B



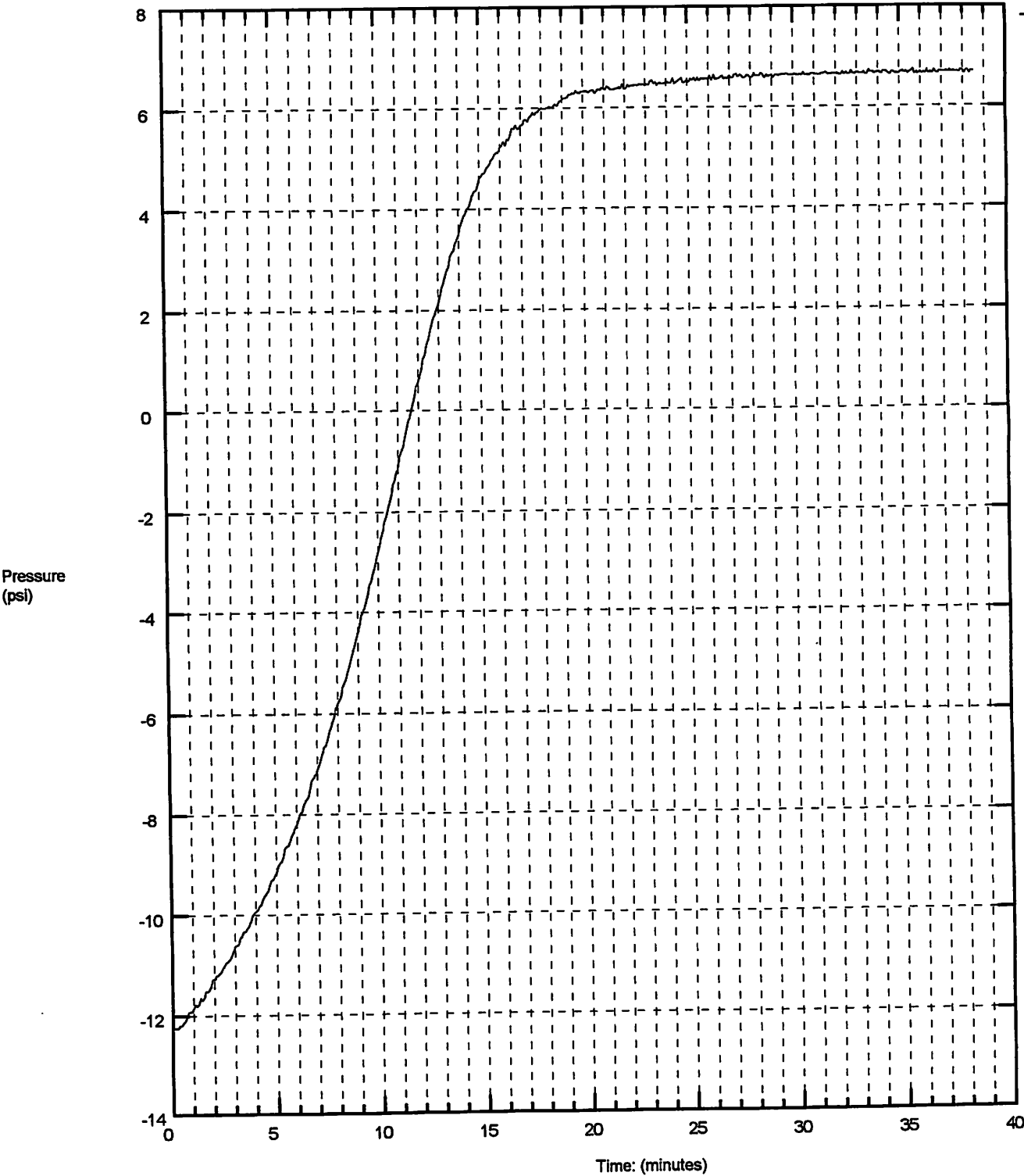
AMEC E & E

Operator BROWN
Sounding: CPT-31
Cone Used: 581

CPT Date/Time: 02-19-82 12:14
Location: 1004
Job Number: TULALIP

Selected Depth(s)
(feet)

—30.84

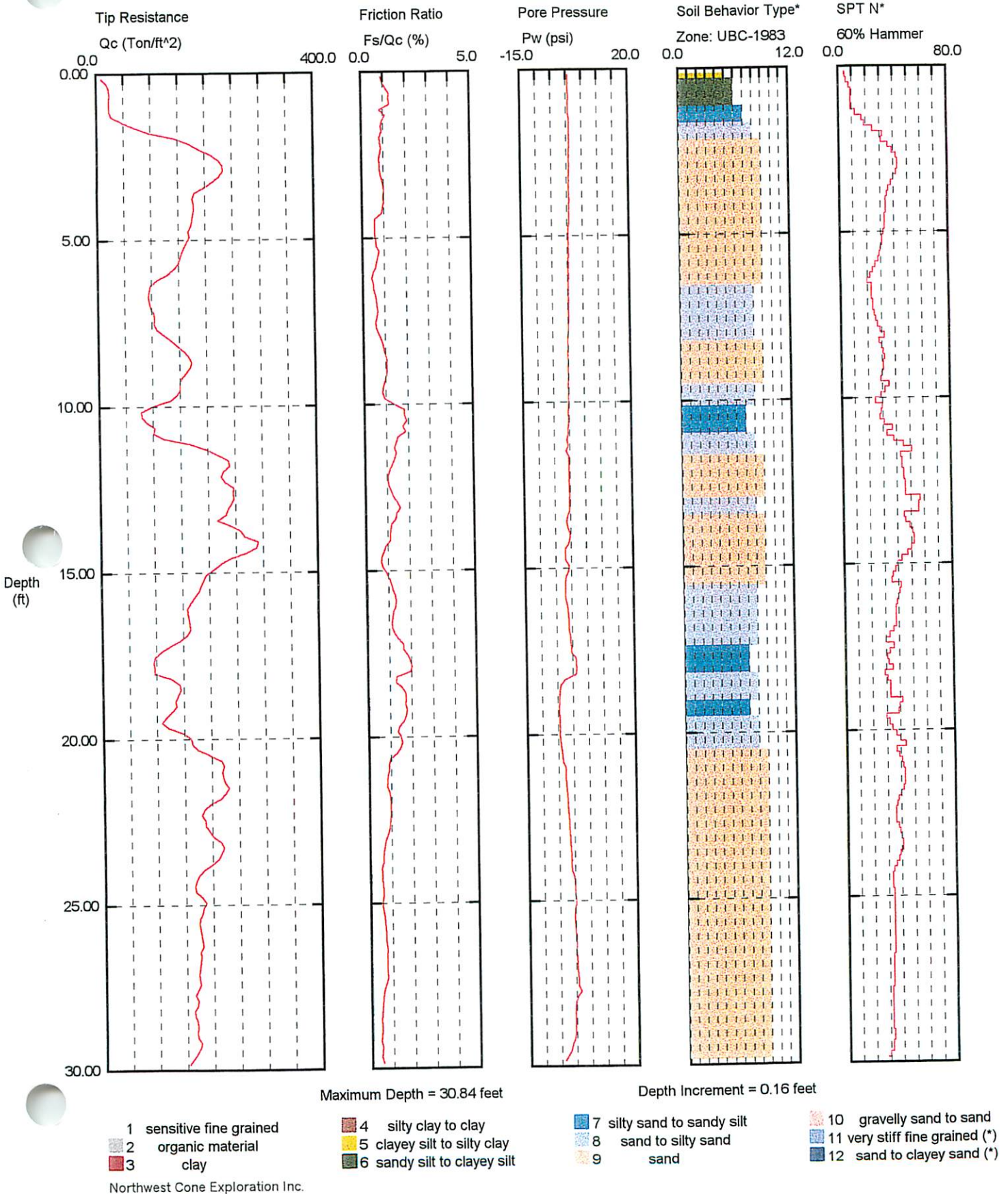


Maximum Pressure = 6.724 psi
Hydrostatic Pressure = 13.385 psi

AMEC E & E

Operator: BROWN
Sounding: 1005
Cone Used: 581

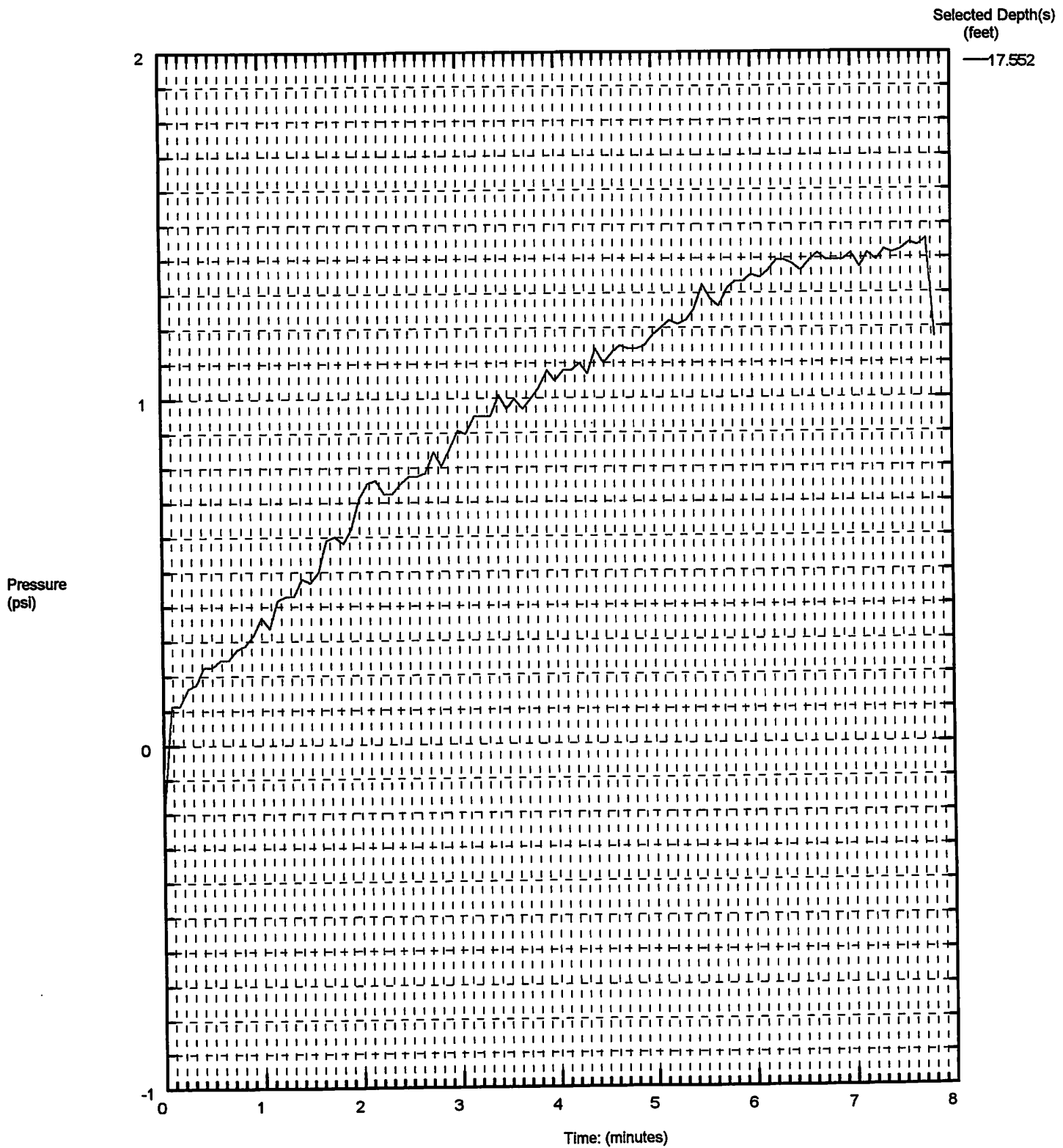
CPT Date/Time: 02-19-02 13:29
Location: Tulalip Casino Dewatering Review
Job Number: 291M13845B



AMEC E & E

Operator BROWN
Sounding: CPT-32
Cone Used: 581

CPT Date/Time: 02-19-82 13:29
Location: 1005
Job Number: TULALIP



Maximum Pressure = 1.455 psi
Hydrostatic Pressure = 7.618 psi

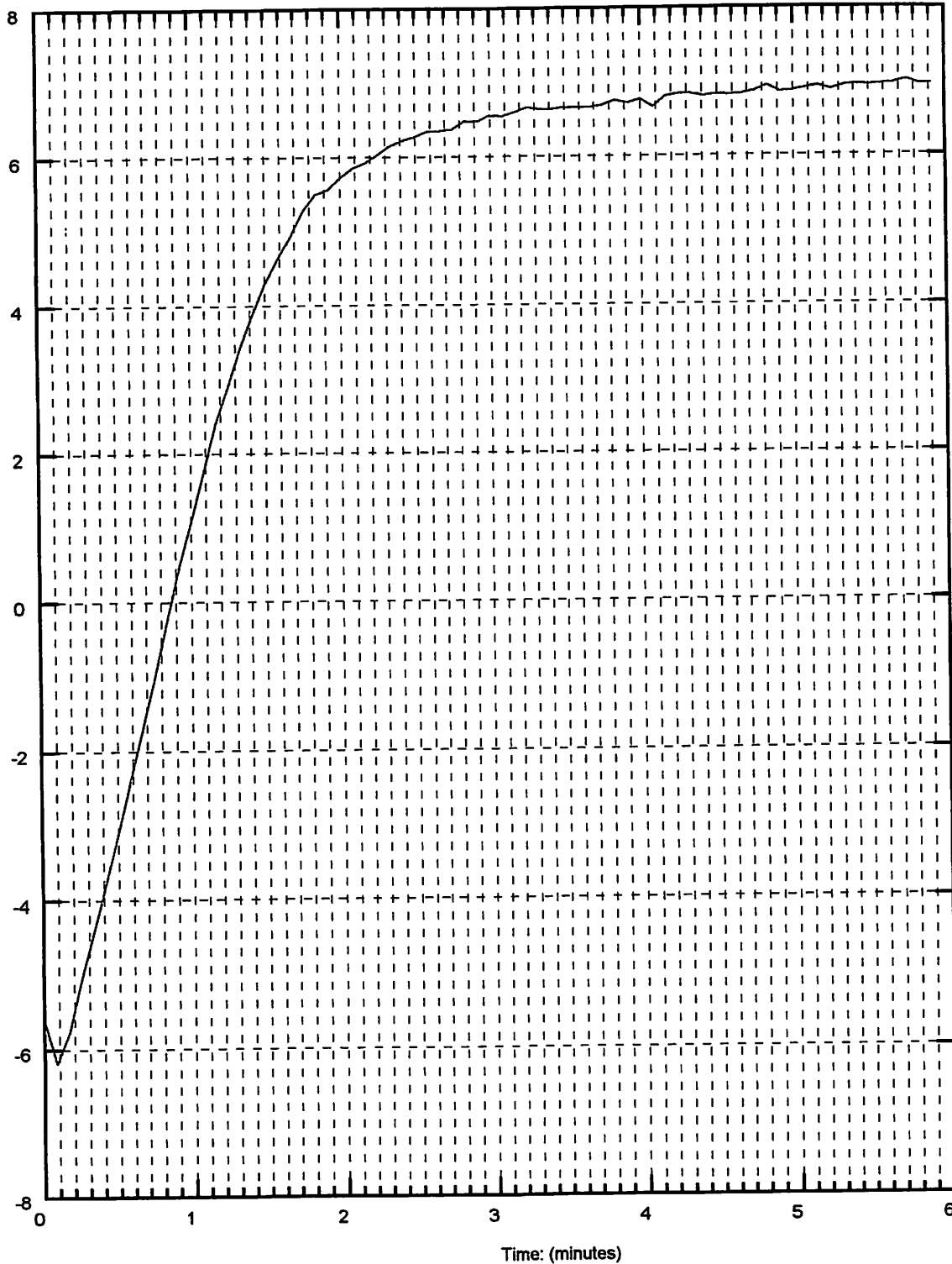
AMEC E & E

Operator BROWN
Sounding: CPT-32
Cone Used: 581

CPT Date/Time: 02-19-82 13:29
Location: 1005
Job Number: TULALIP

Selected Depth(s)
(feet)

30.84



Maximum Pressure = 7.009 psi
Hydrostatic Pressure = 13.385 psi

AMECE & E

Operator: BROWN

Sounding: 1006

Cone Used: 581

CPT Date/Time: 02-19-02 14:11

Location: Tulalip Casino Dewatering Review

Job Number: 291M13845B

Tip Resistance

Qc (Ton/ft²)

Friction Ratio

Fs/Qc (%)

Pore Pressure

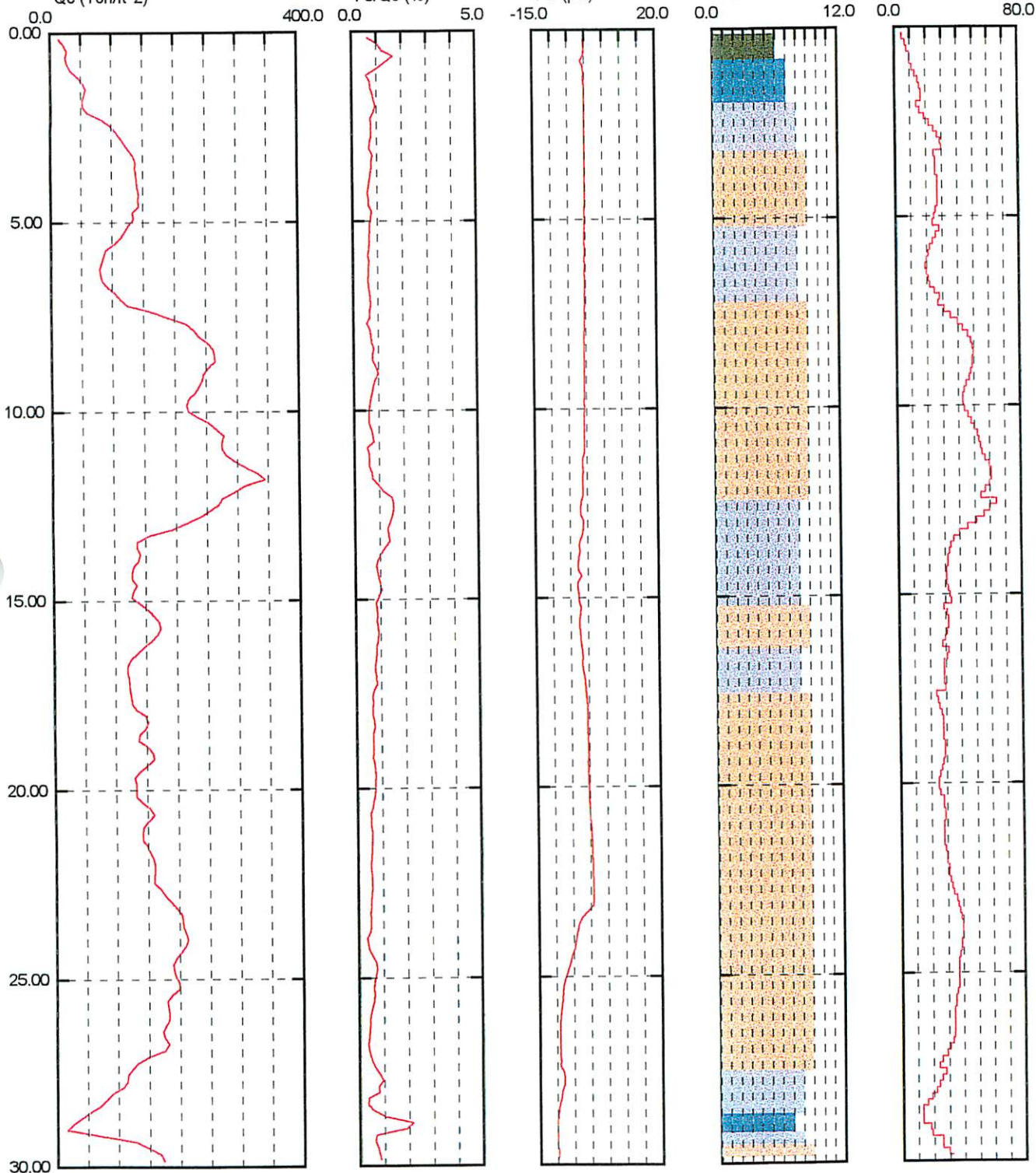
Pw (psi)

Soil Behavior Type*

Zone: UBC-1983

SPT N*

60% Hammer



Maximum Depth = 30.51 feet

Depth Increment = 0.16 feet

- 1 sensitive fine grained
- 2 organic material
- 3 clay

- 4 silty clay to clay
- 5 clayey silt to silty clay
- 6 sandy silt to clayey silt

- 7 silty sand to sandy silt
- 8 sand to silty sand
- 9 sand

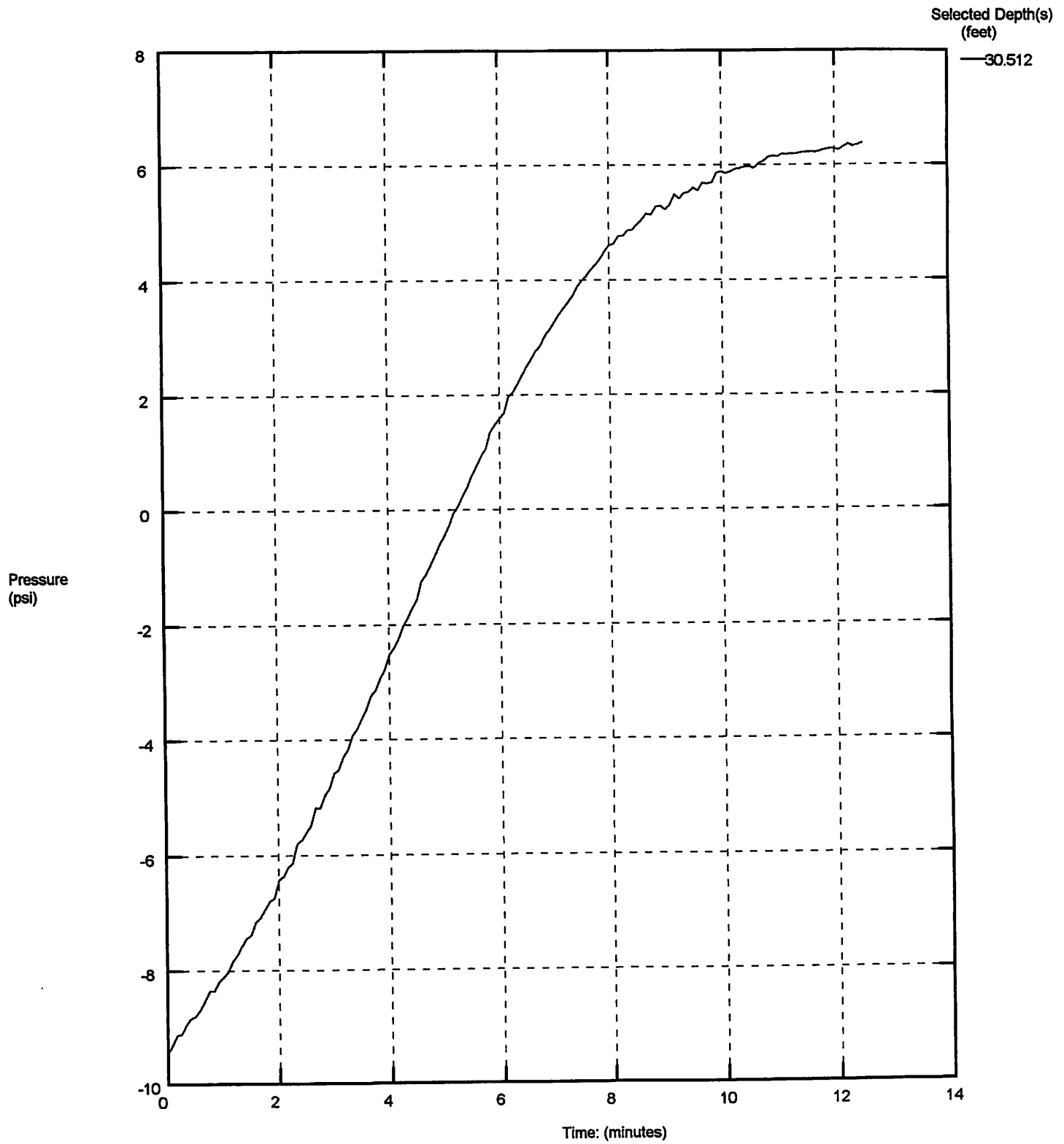
- 10 gravelly sand to sand
- 11 very stiff fine grained (*)
- 12 sand to clayey sand (*)

Northwest Cone Exploration Inc.

AMEC E & E

Operator BROWN
Sounding: CPT-33
Cone Used: 581

CPT Date/Time: 02-19-02 14:11
Location: 1006
Job Number: TULALIP

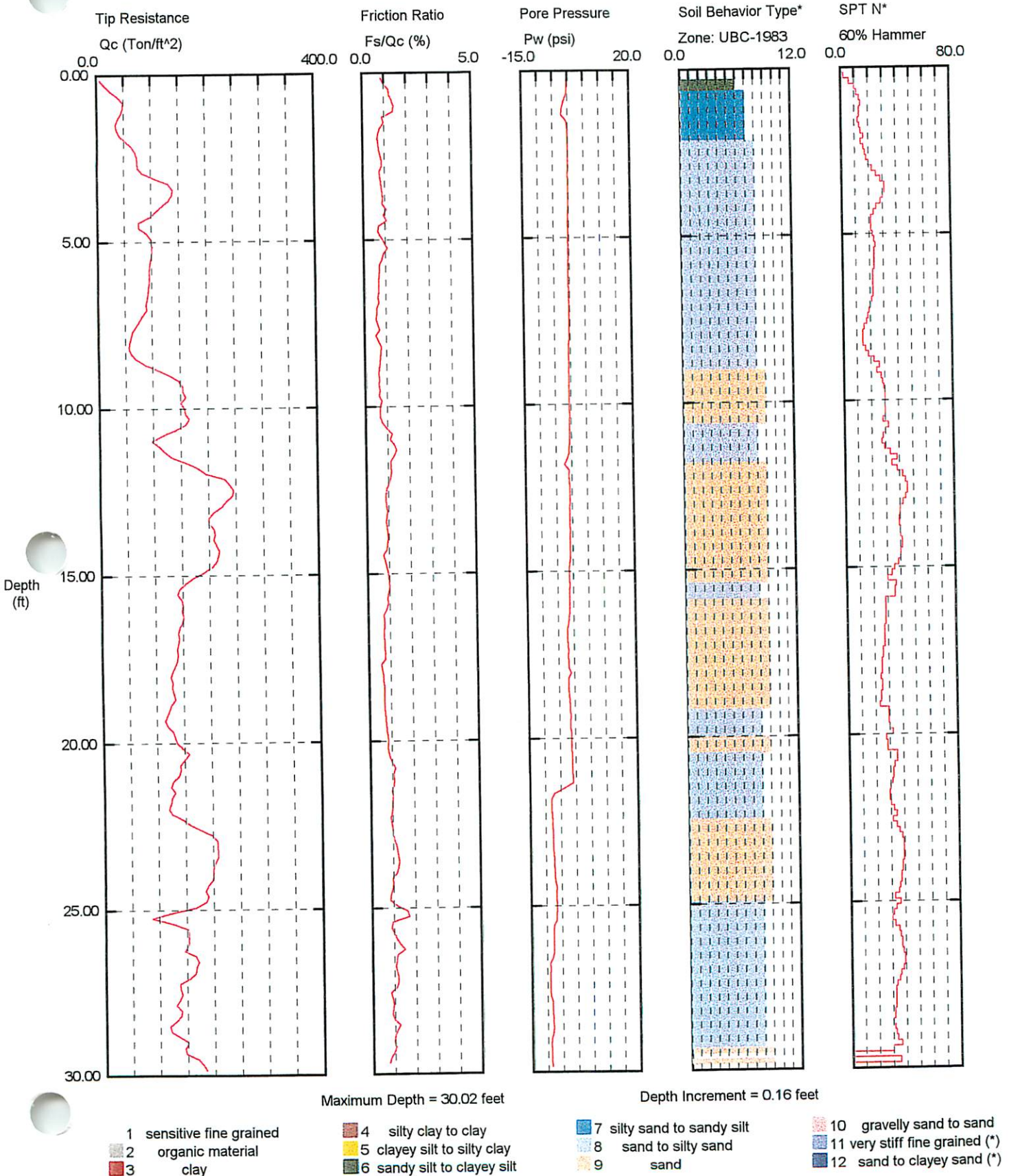


Maximum Pressure = 6.368 psi
Hydrostatic Pressure = 13.242 psi

AMEC E & E

Operator: BROWN
Sounding: 1007
Cone Used: 581

CPT Date/Time: 02-19-02 14:53
Location: Tulip Casino Dewatering Review
Job Number: 291M13845B



AMEC E & E

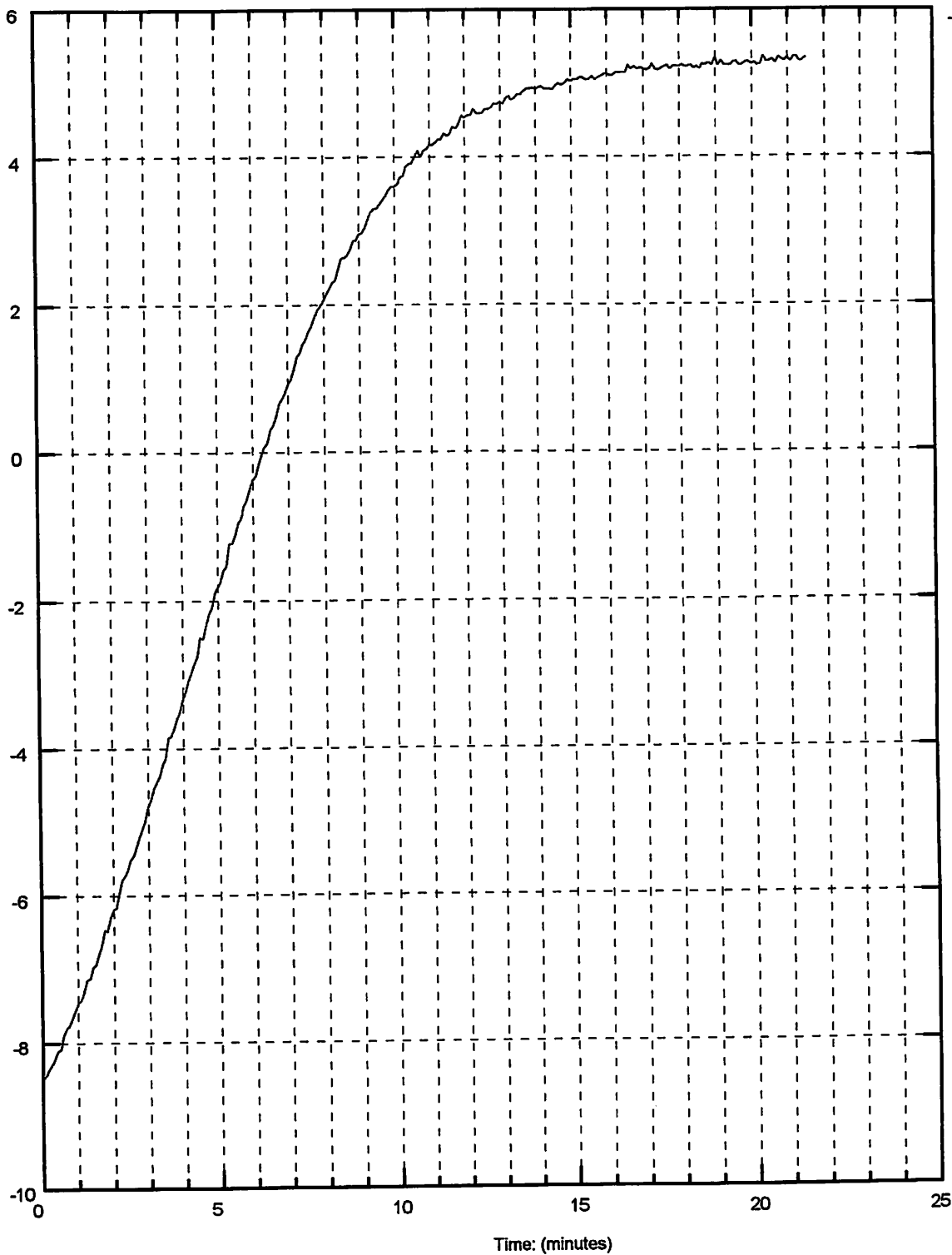
Operator BROWN
Sounding: CPT-34
Cone Used: 581

CPT Date/Time: 02-19-82 14:53
Location: 1007
Job Number: TULALIP

Selected Depth(s)
(feet)

—30.02

Pressure
(psi)

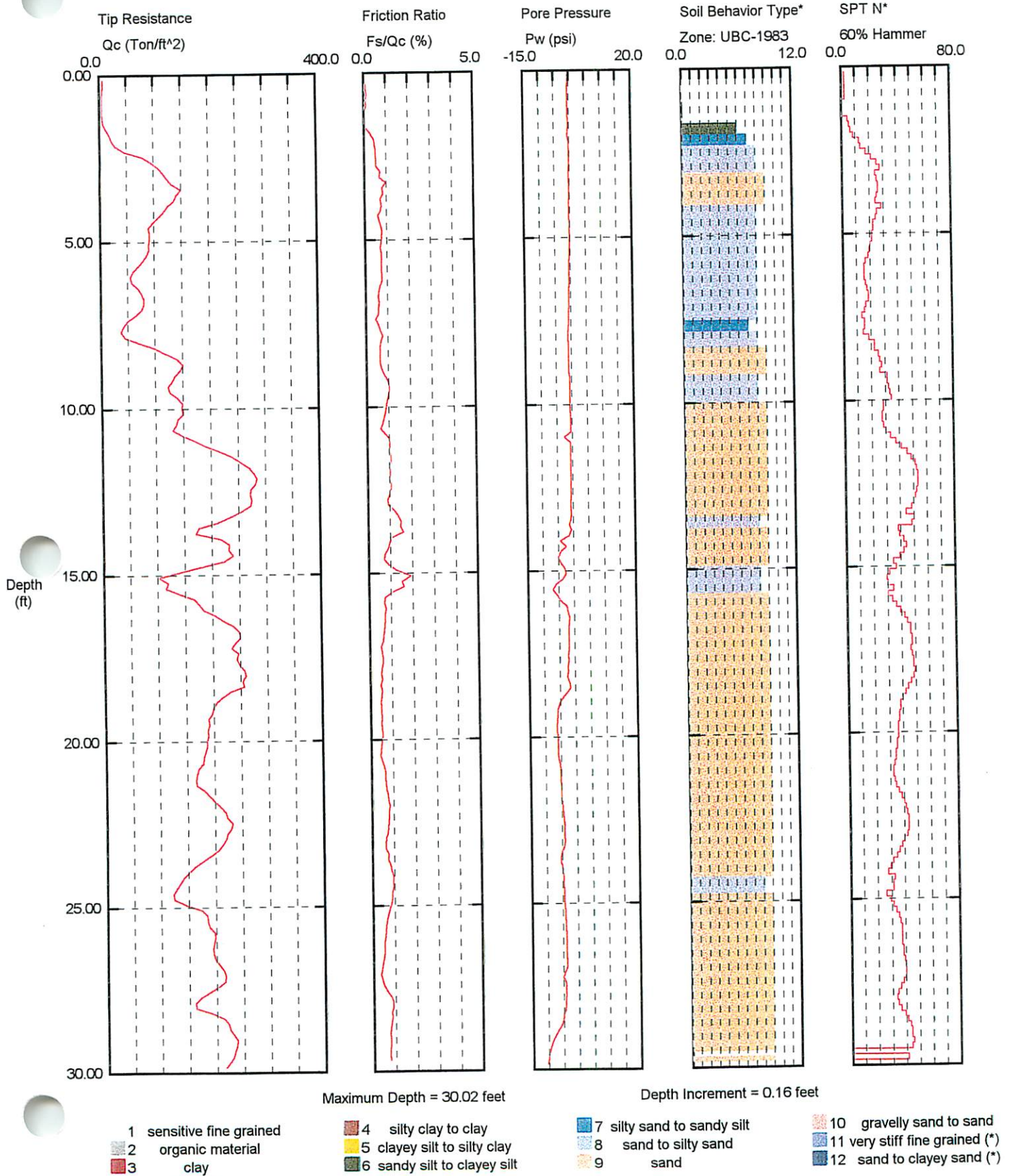


Maximum Pressure = 5.361 psi
Hydrostatic Pressure = 13.029 psi

AMEC E & E

Operator: BROWN
Sounding: 1008
Cone Used: 581

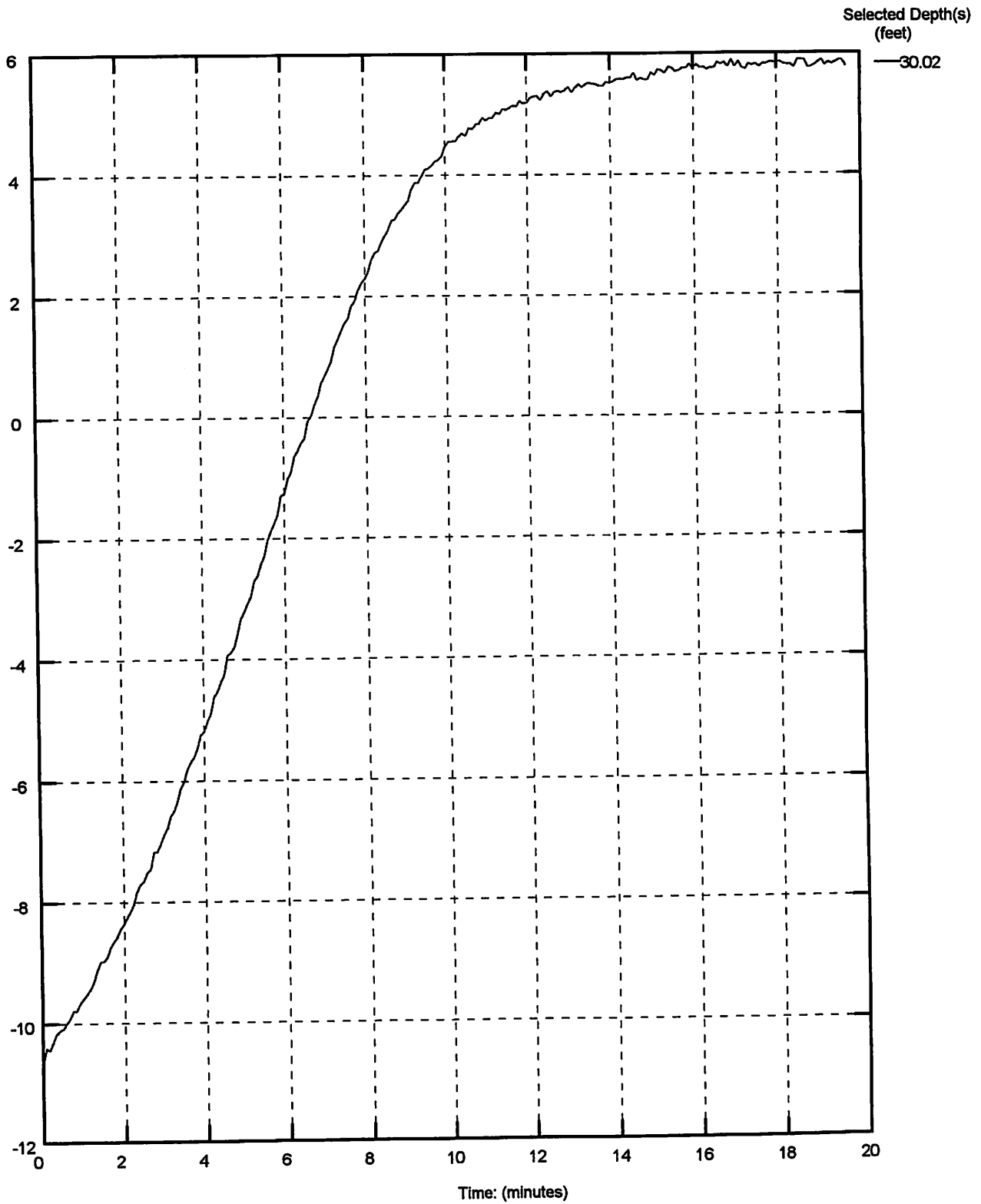
CPT Date/Time: 02-19-02 15:43
Location: Tulalip Casino Dewatering Review
Job Number: 291M13845B



AMEC E & E

Operator BROWN
Sounding: CPT-35
Cone Used: 581

CPT Date/Time: 02-19-82 15:43
Location: 1008
Job Number: TULALIP



Maximum Pressure = 5.89 psi
Hydrostatic Pressure = 13.029 psi

TEST PIT LOGS

1-91M-13845-A

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
---------------------	-----------------------------	-------------------

Test Pit TP-1

Location: Among brush

Approximate ground surface elevation: Unknown

0.0 - 1.0	Medium dense, moist, dark brown, silty, fine SAND; prevalent organics	
1.0 - 5.0	Medium dense, moist, tan, SAND with trace silt; scattered areas of dark brown, silty sand	G-1
5.0 - 8.0	Medium dense, moist, tan and gray, medium SAND	

Test pit terminated at approximately 8 feet

Moderate caving at 7 feet

Moderate seepage at 7 feet

Test Pit TP-2

Location: Wooded Area

Approximate ground surface elevation: Unknown

0.0 - 3.0	Medium dense, moist, brown, silty, fine SAND to SAND with some silt; some organics; roots to 4-foot depth	G-1
3.0 - 7.0	Medium dense, moist, tan and gray, fine SAND	
7.0 - 8.0	Medium dense, moist, gray, medium SAND with some gravel	
8.0 - 11.0	Medium dense, moist, gray, fine SAND	

Test pit terminated at approximately 11 feet

No caving observed

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
---------------------	-----------------------------	-------------------

Test Pit TP-3

Location: Wooded Area

Approximate ground surface elevation: Unknown

0.0 - 2.0	Medium dense, moist, dark brown, fine SAND with some silt; prevalent gravel and small cobbles; prevalent organics; roots to 3-foot depth	
2.0 - 5.0	Medium dense, moist, tan and gray, fine SAND with trace silt	G-1
5.0 - 9.0	Medium dense, moist, gray, fine SAND	

Test pit terminated at approximately 9 feet

Slight caving at 7 feet

Slow seepage at 7 feet

Test Pit TP-4

Location: Wooded Area

Approximate ground surface elevation: Unknown

0.0 - 1.0	Medium dense, moist, dark brown, silty SAND; prevalent organics; roots to 3.5-foot depth	
1.0 - 3.0	Medium dense, moist, tan, silty SAND	
3.0 - 6.0	Medium dense, moist, tan and gray, fine SAND with trace silt	
6.0 - 10.0	Medium dense, moist, gray, fine SAND	G-1

Test pit terminated at approximately 10 feet

Slight caving at 8.5 feet

Slow seepage at 8.5 feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
---------------------	-----------------------------	-------------------

Test Pit TP-5

Location: Grassy Area

Approximate ground surface elevation: Unknown

0.0 - 3.0	Medium dense, moist, dark brown, silty SAND and sandy SILT; localized seepage at 2-foot depth	
-----------	---	--

3.0 - 5.0	Medium dense, moist, gray, fine to medium SAND with trace silt	
-----------	--	--

5.0 - 10.0	Loose to medium dense, moist, gray, medium SAND	
------------	---	--

G-1

Test pit terminated at approximately 10 feet

Moderate caving at 5 feet

No seepage observed

Date Excavated: 10/31/01

Logged by: TMM

TEST PIT LOGS

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
---------------------	-----------------------------	-------------------

Test Pit TP-6

Location: Approximately 571' north of boring B-1

Approximate ground surface elevation: Unknown

0.0 – 4"	Vegetation / Topsoil	
4" - 1.5'	Loose to medium dense at –1.5', moist, brown, fine to medium SAND, some silt, some organics (roots)	
1.5' - 2.5'	Medium dense, moist, gray, medium grained SAND intermixed with black cinder like material, trace organics (roots)	S-1@2'
2.5'-10.0'	Medium dense, moist, gray, fine to medium SAND, some mottling (to approximately –7'), trace silt (– 3.5'), trace gravel, trace organics (roots to –4')	S-2@7.5'

Test pit terminated at approximately 10.0 feet

Moderate caving at –1.5 to –9.0 feet

No seepage observed

Test Pit TP-7

Location: Approximately 83' north of boring B-1

Approximate ground surface elevation: Unknown

0.0 – 8"	Vegetation / Topsoil	
8" – 2.5'	Loose to medium dense at –2.0', moist, brown grading to gray at –2.0', fine to medium SAND, some silt, some organics (roots)	
2.5' – 10.0'	Medium dense, moist, mottled, gray, fine to medium SAND, some silt grading to trace at –4', trace organics (roots to –6')	S-1@-7'

Test pit terminated at approximately 10.0' feet

No caving observed

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-8

Location: Approximately 357' south of boring B-1

Approximate ground surface elevation: Unknown

0.0 – 10"	Vegetation / Topsoil	
10" - 2.5'	Loose to medium dense at -2', moist, brown grading to gray at -2', fine to medium SAND, some silt, some organics (roots)	
2.5' - 10.0'	Medium dense, moist, mottled (-2' to -4'), gray, fine to medium SAND, trace silt, trace gravel, trace organics	S-1@-8'

Test pit terminated at approximately 10.0' feet

No caving observed

No seepage observed

Test Pit TP-9

Location: Approximately 15' north-east of Infiltration excavation I-2

Approximate ground surface elevation: Unknown

0.0 – 5.5'	Medium dense, moist, light brown grading to light gray, fine to medium SAND, some silt, some organics (roots)	S-1@-3"
5.5' – 10.0'	Medium dense, moist, gray fine to medium SAND, trace silt	S-1@-6'

Test pit terminated at approximately 10.0' feet

Slight caving at -1' to -6' feet

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-10

Location: Approximately 35' west of boring B-4
Approximate ground surface elevation: Unknown

0.0 - 1.0'	Vegetation / Topsoil	
1.0' - 5.5'	Loose to medium dense at -3', moist, mottled, fine to medium SAND, some silt, some organic (roots to -3'), trace gravel	
5.5' - 8.5'	Medium dense, wet grading to saturated at -7', mottled, gray, fine to medium SAND, trace silt	

Test pit terminated at approximately 8.5' feet
Severe caving at -4' to -8' feet
Rapid seepage at -7.5' feet (TP filled to -6.5' in approximately 10 min)

Test Pit TP-11

Location: Approximately 167' north-west of Piezo Meter P-5
Approximate ground surface elevation: Unknown

0.0 - 0.5'	Vegetation / Topsoil	
0.5' - 2.5'	Loose to medium dense at -1.5', moist, mottled, light gray, fine SAND, some silt grading to trace at -2.5'	
2.5' - 10.0'	Medium dense, moist to wet at -5', gray, fine SAND, trace silt, trace gravel (organics consisting of wood / peat located in western half of TP from -4 to -6')	S1@-7.5' S-1@-5'

Test pit terminated at approximately 10.0' feet
Severe caving at -2' to 9.0' feet
Slow seepage at -4' feet
Moderate seepage at 10.0' feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-12

Location: Approximately 42' east of Piezo meter P-4
Approximate ground surface elevation: Unknown

0.0 - 0.5'	Vegetation / Topsoil	
0.5' - 2.0'	Loose, moist, brown grading to gray at -2', fine SAND, some silt, some organics (roots)	
2.0' - 8.0'	Medium dense, moist, mottled, gray, fine SAND, trace gravel, trace silt, trace organics (roots)	S-1@-7'
8.0' - 10.0'	Medium dense, moist, light gray, fine SAND	S-2@-10'
Test pit terminated at approximately 10.0' feet		
Moderate caving at -2 to -8' feet		
No seepage observed		

Test Pit TP-13

Location: Approximately 41' west of infiltration excavation I-3
Approximate ground surface elevation: Unknown

0.0 - 2"	Vegetation / Topsoil	
2" - 2.0'	Loose to medium dense at -1.5', moist, gray, fine to medium SAND, some silt, some organics (roots)	
2.0' - 3.0'	Medium dense, moist, brown, silty fine SAND	S-1@-2.5'
3.0' - 4.5'	Medium dense, moist, gray, fine to medium SAND, some silt	
4.5' - 6.0'	Medium dense, wet, mottled, orange/brown, fine to medium silty SAND	S-2@-5'
6.0' - 8.5'	Medium dense, wet, gray, fine to medium SAND with interbedded silt layers	S-3@-7'
Test pit terminated at approximately -8.5 feet		
Severe caving at 0 to -8' feet		
Slow seepage at -2.5' feet		
Moderate seepage at -4' feet		
Rapid seepage at -8' feet		

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-14

Location: Approximately 121' east of infiltration excavation I-3

Approximate ground surface elevation: Unknown

0.0 - 2.5'	Topsoil / Strippings	
2.5' - 5.0'	Medium dense, moist to wet at - 4', mottled, brown fine to medium SAND, some silt	
5.0' - 9.5'	Medium dense, wet, gray, fine to medium SAND, trace gravel, trace silt	S-1@-7.5'

Test pit terminated at approximately -9.5' feet

Severe caving at -5' to -9.5' feet

Moderate seepage at -5' feet

Test Pit TP-20

Location: Approximately 21' west of Piezo Meter P-6

Approximate ground surface elevation: Unknown

0.0 - 10"	Vegetation / Topsoil	
10" - 5.0'	Loose to medium dense at -2', moist, mottled, wet, light gray, silty fine SAND	
5.0' - 9.0'	Medium dense, wet, gray, fine to medium SAND, trace silt	S-1@-7'

Test pit terminated at approximately 9.0' feet

Severe caving at 0 to -9' feet

Slow seepage at -2' feet

Rapid seepage at -6' feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-21

Location: Approximately 121' south of Piezo Meter P-6

Approximate ground surface elevation: Unknown

0.0 – 6"	Vegetation / Topsoil	
6" - 6.0'	Medium dense, moist, mottled, brown, fine SAND, some silt, trace organics to (roots to -2')	
6.0' - 8.5'	Medium dense, wet, gray, fine to medium SAND, trace silt	S-1@-7'
Test pit terminated at approximately 8.5' feet		
Severe caving at 0 to 8' feet		
Slow seepage at -6' feet		

Test Pit TP-22

Location: Approximately 131' east of boring B-7

Approximate ground surface elevation: Unknown

0.0 – 8"	Vegetation / Topsoil	
8" - 2.0'	Loose, moist, brown grading to gray at -2', fine to medium SAND, some silt, some organics (roots)	
2.0' - 6.5'	Medium dense, moist to wet at -6.4', mottled, gray, fine to medium SAND, trace silt, trace organic (roots)	
6.5' – 6.8'	Medium dense, wet, interbedded silt horizon	S-1@-6.5'
6.8' – 9.5'	Medium dense, wet to saturated at -8', mottled, gray, fine to medium SAND, trace silt	S-2@-8.5'

Test pit terminated at approximately -9.5' feet

Severe caving at -2 to -8.5' feet

Slow seepage at -5' to -6.5' feet

Rapid seepage at -7' to -8.5' feet (TP filled to -7' in approximately 7 min)

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-23

Location: Approximately 225' south-east of boring B-7

Approximate ground surface elevation: Unknown

0.0 – 8"	Vegetation / Topsoil	
8" - 1.5'	Loose to Medium dense at –1.5', moist, brown, silty fine SAND, some organics (roots)	
1.5' - 7.0'	Medium dense, moist, mottled, gray, fine to medium SAND, trace organics (roots at –1.5 to –5')	S-1@-6.5'
7.0' – 8.0'	Medium dense, moist, brown, moist, fine to medium SAND, trace silt	S-2@-7.5'
8.0' – 10.0'	Medium dense, wet to saturated at –10', mottled, gray, fine SAND	

Test pit terminated at approximately 10' feet

Severe caving at –3 to –9' feet

Slow seepage at –6' feet

Moderate seepage at –7' feet

Rapid seepage at –8 to –10' feet

Date Excavated: November 27 and 28, 2001

Logged by: KHM

TEST PIT LOGS

1-91M-13845-A

Depth (feet)

Material Description

Sample No.

Test Pit FTP-15

Location:

Approximate ground surface elevation: 49 feet

0.0 – 0.7	Topsoil/Stripping	
0.7 – 2.0	Loose to medium dense at 2', moist, brown grading to gray at 2', fine to medium SAND with some silt, trace organics to 3' (roots)	
2.0 – 9.5	Medium dense, moist to wet at 4.5', gray fine to medium SAND with trace silt and gravel	

Test pit terminated at approximately 9.5 feet

Severe caving from 1 to 9 feet

Moderate seepage at 4 feet

Rapid seepage at 6 feet

Test Pit FTP-16

Location:

Approximate ground surface elevation: 50 feet

0.0 – 0.8	Topsoil/Stripping	
0.8 – 3.0	Loose to medium dense, moist, brown grading to gray at 3', fine to medium SAND with some silt, trace organics to 3' (roots)	S-1@-2'
3.0 – 9.0	Medium dense, moist to saturated at 6.5', gray fine to medium SAND with trace silt and gravel	S-2@-5.5'

Test pit terminated at approximately 9.0 feet

Severe caving from 3 to 9 feet

Moderate seepage at 3.5 feet

Rapid seepage at 6.5 feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit FTP-17

Location:

Approximate ground surface elevation: 49 feet

0.0 – 0.7	Topsoil/Stripping	
0.7 – 3.5	Loose to medium dense, moist, mottled, brown grading to gray at 3', fine to medium SAND with some silt, trace organics to 2' (roots)	S-1@-1.5'
3.5 – 10.0	Medium dense, moist to wet at 6', gray fine to medium SAND with trace silt	S-2@-6'

Test pit terminated at approximately 10.0 feet

Moderate to Severe caving from 2 to 9 feet

Slow seepage at 1.5 feet

Moderate seepage at 6 feet

Rapid seepage at 7.5 feet

Test Pit FTP-18

Location:

Approximate ground surface elevation: 50 feet

0.0 – 0.7	Topsoil/Stripping
0.7 – 2.0	Loose, moist, brown grading to gray at 2', fine SAND with some silt, some organics (roots)
2.0 – 9.5	Medium dense, moist, gray, fine to medium SAND with trace silt

Test pit terminated at approximately 9.5 feet

Moderate to Severe caving from 3 to 9 feet

Moderate seepage at 4 feet

Moderate to Severe seepage at 6 feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit FTP-19

Location:

Approximate ground surface elevation: 49.5 feet

0.0 – 0.7	Topsoil/Stripping	
0.7 – 3.5	Loose to medium dense, moist, mottled, brown grading to gray at 2', fine to medium SAND with some silt, some organics to 1.5' (roots)	
3.5 – 4.5	Medium dense, moist, light brown and gray, silty, fine SAND, trace organics (roots)	S-1@ 3.5'
4.5 – 6.5	Medium dense, moist, light gray, fine SAND with some silt	S-2@ 6'
6.5 – 9.5	Medium dense, moist to wet at 7', gray, fine SAND with trace silt	

Test pit terminated at approximately 9.5 feet

No caving observed

Moderate seepage at 7 feet

Test Pit FTP-19A

Location:

Approximate ground surface elevation: 48 feet

0.0 – 1.0	Topsoil/Stripping
1.0 – 2.0	Loose, moist, brown grading to gray at 2', fine SAND with some silt, trace organics (roots)
2.0 – 9.0	Medium dense, moist to wet at 6', mottled to 5', gray, fine to medium SAND with trace silt and gravel (Fine grained SAND from 2 to 4')

Test pit terminated at approximately 9.0 feet

Severe caving from 0 to 9 feet

Slow seepage at 4 feet

Moderate seepage at 7 feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit FTP-19B

Location:

Approximate ground surface elevation: 50 feet

0.0 – 1.5	Topsoil/Stripping
1.5 – 2.5	Loose, moist, brown grading to gray at 2.5', silty fine SAND, abundant organics (roots)
2.5 – 6.0	Medium dense, moist, gray, fine to medium SAND with trace silt

Test pit terminated at approximately 6.0 feet

Slight caving from 4.5 to 6 feet

Moderate seepage at 6 feet

Test Pit FTP-19C

Location:

Approximate ground surface elevation: 50 feet

0.0 – 0.8	Topsoil/Stripping
0.8 – 3.0	Loose to medium dense at 2.5', moist, gray, fine to medium SAND with some silt, some organics (small roots)
3.0 – 4.0	Medium dense, moist, brown, silty, fine SAND, some organics (roots)
4.0 – 6.0	Medium dense, moist, gray, fine to medium SAND, trace silt

Test pit terminated at approximately 6 feet

Moderate caving from 4 to 6 feet

Moderate to Rapid seepage at 6 feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit FTP-19D

Location:

Approximate ground surface elevation: 49 feet

0.0 – 0.7	Topsoil
0.7 – 2.5	Loose to medium dense, moist, mottled, gray, fine to medium SAND with some silt, some organics to 2' (roots)
2.5 – 4.0	Medium dense, moist, brown, silty fine SAND, heavy mottling
4.0 – 7.0	Medium dense, moist, mottled, gray, fine SAND with some silt, trace silt at 7'

Test pit terminated at approximately 7.0 feet

No caving observed

Slow seepage at 7 feet

Test Pit FTP-19E

Location:

Approximate ground surface elevation: 49 feet

0.0 – 0.7	Topsoil
0.7 – 1.5	Loose, moist, brown, fine SAND with some silt, trace organics (roots)
1.5 – 5.5	Medium dense, moist, mottled gray, fine to medium SAND with some silt

Test pit terminated at approximately 5.5 feet

No caving observed

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit FTP-19F

Location:

Approximate ground surface elevation: 48 feet

0.0 – 0.7	Topsoil
0.7 – 1.5	Loose, moist, brown, fine SAND with some silt, trace organics (roots)
1.5 – 3.0	Medium dense, moist, gray, fine to medium SAND with some silt
3.0 – 5.0	Medium dense, moist, gray, fine to medium SAND with trace silt

Test pit terminated at approximately 5.0 feet

Slight caving from 4 to 5 feet

Moderate seepage at 5 feet

Test Pit FTP-19G

Location:

Approximate ground surface elevation: 49 feet

0.0 – 0.8	Topsoil
0.8 – 1.5	Loose, moist, brown grading to light gray, silty, fine SAND
1.5 – 5.0	Medium dense, moist to wet at 4', mottled gray, fine to medium SAND with trace silt

Test pit terminated at approximately 5.0 feet

Slight caving from 3 to 5 feet

Moderate to rapid seepage at 5 feet

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit FTP-19H

Location:

Approximate ground surface elevation: 51 feet

0.0 – 0.5	Topsoil
0.5 – 1.5	Loose, moist, brown grading to gray at 1.5', silty fine SAND, some organics (small roots)
1.5 – 5.0	Medium dense, moist, gray, fine to medium SAND with trace silt

Test pit terminated at approximately 5.0 feet

Slight caving from 4 to 5 feet

Moderate seepage at 5 feet

Test Pit FTP-19I

Location:

Approximate ground surface elevation: 52 feet

0.0 – 2.0	Topsoil
2.0 – 3.5	Loose, moist, brown, silty, fine SAND, some organics (small roots)
3.5 – 4.5	Medium dense, moist, mottled gray, fine to medium SAND with some silt
4.5 – 7.0	Medium dense, moist, mottled gray, fine to medium SAND with trace silt

Test pit terminated at approximately 7.0 feet

Moderate caving from 4 to 7 feet

Moderate seepage at 6.5 feet

Date Excavated: November 29, 2001

Logged by: KHM

TEST PIT LOGS

2-91M-13845-B

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-101

Location: 100 feet north of south end of east "Home Depot" trench

Approximate ground surface elevation: Unknown

0.0 - 0.25	Topsoil (new root mat since original site stripping)	
0.25 - 1.0	Medium dense, moist, light orange-brown silty fine to medium SAND, occasional root	S-1 (.75')
1.0 - 3.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, scattered roots	S-2 (2')
3.5 - 10.0	Loose to medium dense, moist, gray SAND, trace silt, gravel. Fine sand layer from 6.5 to 7.5 feet. Becomes medium dense at 8 feet. Scattered cobbles	S-3 (9')

Test pit terminated at approximately 10 feet

No caving observed

No seepage observed

Test Pit TP-102

Location: 100 feet north of south end of west "Home Depot" trench

Approximate ground surface elevation: Unknown

0.0 - 0.33	Topsoil (new root mat since original site stripping)	
0.33 - 1.5	Medium dense, moist, light orange-brown silty fine to medium SAND, occasional roots. Extends as deep as 2.5 feet on east side of test pit.	
1.5 - 4.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, scattered large roots.	
4.5 - 10.0	Loose to medium dense, moist, gray SAND, trace silt, gravel. Gravelly coarse SAND layer from 6.5 to 7.5 feet.	S-1 (7') S-2 (9')

Test pit terminated at approximately 10 feet

Slight caving at 8 feet

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-103

Location: 500 feet north of south end of east "Home Depot" trench

Approximate ground surface elevation: Unknown

0.0 - 0.2	Topsoil (new root mat since original site stripping)	
0.2 - 0.5	Medium dense, moist, light orange-brown silty fine to medium SAND, occasional roots.	
0.5 - 4.0	Loose to medium dense, moist, tan, fine to medium SAND, some silt, trace gravel, scattered roots.	
4.0 - 7.0	Loose, moist, gray medium to coarse SAND, trace gravel.	S-1 (5')
7.0 - 8.0	Loose to medium dense, moist, gray fine SAND, some silt.	
8.0 - 11.0	Loose to medium dense, moist, gray SAND, trace silt, gravel, occasional cobble.	S-2 (10')

Test pit terminated at approximately 11 feet

Slight caving from 4 to 7 feet

No seepage observed

Test Pit TP-104

Location: 700 feet north of south end of west "Home Depot" trench

Approximate ground surface elevation: Unknown

0.0 - 0.33	Medium dense, moist, light orange-brown silty fine to medium SAND, occasional root.	
0.33 - 2.0	Loose to medium dense, moist, tan, fine to medium SAND, some silt, scattered roots.	
2.0 - 9.0	Loose to medium dense, moist, gray SAND, trace silt, gravel. Occasional root and interbedded rust-colored fine to medium SAND, gravel extending down to 6 feet.	S-1 (8')

Test pit terminated at approximately 9 feet

Moderate caving at from 9 up to 3 feet

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-105

Location: 200 feet south of north end of east "Home Depot" trench

Approximate ground surface elevation: Unknown

0.0 - 0.5	Topsoil (new root mat since original site stripping)	
0.5 - 1.5	Medium dense, moist, light orange-brown silty fine to medium SAND, occasional roots. Extends as deep as 3 feet on east side of test pit.	S-1 (1')
1.5 - 4.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, scattered roots.	
4.5 - 10.0	Loose to medium dense, moist, gray SAND, trace silt, gravel, scattered cobbles.	S-2 (7')

Test pit terminated at approximately 10 feet

No caving observed

No seepage observed

Test Pit TP-106

Location: 200 feet south of north end of east "Home Depot" trench

Approximate ground surface elevation: Unknown

0.0 - 0.2	Topsoil (new root mat since original site stripping)	
0.2 - 1.5	Medium dense, moist, light orange-brown silty fine to medium SAND, occasional roots. Extends as deep as 3 feet on east side of test pit.	
1.5 - 3.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, scattered roots.	
3.5 - 11.0	Loose to medium dense, moist, gray SAND, trace silt, gravel, scattered cobbles.	S-1 (4')
	Fine silty SAND lens from 8.0 to 8.5 feet.	S-2 (9')

Test pit terminated at approximately 11 feet

No caving observed

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-107

Location: Approximately 350 feet north of south end of east "Chelsea" trench
Approximate ground surface elevation: Unknown

0.0 - 0.75	Topsoil	
0.75 - 2.0	Loose to medium dense, moist, orange-brown silty fine to medium SAND, occasional roots. Extends as deep as 2.5 feet in center of test pit.	S-1 (1')
2.0 - 3.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, occasional root.	S-2 (3')
3.5 - 9.0	Loose to medium dense, moist, gray SAND, trace silt, gravel.	S-3 (6')

Test pit terminated at approximately 9 feet
Slight caving at 7 feet
No seepage observed

Test Pit TP-108

Location: Approximately 350 feet north of south end of west "Chelsea" trench
Approximate ground surface elevation: Unknown

0.0 - 0.75	Topsoil	
0.75 - 2.25	Loose to medium dense, moist, orange-brown silty fine to medium SAND, occasional roots.	
2.25 - 3.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, occasional root.	
3.5 - 9.0	Loose to medium dense, moist, gray SAND, trace silt, gravel.	S-1 (4') S-2 (9')

Test pit terminated at approximately 9 feet
No caving observed
No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-109

Location: Approximately 900 feet north of south end of east "Chelsea" trench

Approximate ground surface elevation: Unknown

0.0 - 0.3	Topsoil	
0.3 - 1.5	Loose to medium dense, moist, orange-brown silty fine to medium SAND, occasional roots.	
1.5 - 3.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, occasional roots.	S-1 (4')
3.5 - 10.0	Loose to medium dense, moist, gray SAND, trace silt, gravel.	S-2 (8.5')

Test pit terminated at approximately 10 feet

No caving observed

No seepage observed

Test Pit TP-110

Location: Approximately 900 feet north of south end of west "Chelsea" trench

Approximate ground surface elevation: Unknown

0.0 - 0.75	Topsoil	S-1 (1')
0.75 - 2.0	Loose to medium dense, moist, orange-brown silty fine to medium SAND, occasional roots.	
2.0 - 4.5	Loose to medium dense, moist, tan, fine to medium SAND, some silt, occasional roots down to 3.0 feet.	
4.5 - 6.0	Loose, moist, gray, medium to coarse sand	S-2 (5')
6.0 - 7.5	Loose to medium dense, moist, gray, fine to medium SAND, trace silt.	
7.5 - 9.0	Loose to medium dense, moist, gray SAND, trace silt, gravel.	S-3 (8')

Test pit terminated at approximately 9 feet

No caving observed

No seepage observed

<u>Depth (feet)</u>	<u>Material Description</u>	<u>Sample No.</u>
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Test Pit TP-111

Location: Approximately 1350 feet north of south end of east "Chelsea" trench
Approximate ground surface elevation: Unknown

0.0 - 0.75	Topsoil
0.75 - 2.0	Loose to medium dense, moist, tan, fine to medium SAND, trace silt, occasional roots (as deep as 3 feet in west side of test pit)
2.0 - 3.5	Loose to medium dense, moist, tan, fine to medium SAND, trace to some silt, occasional root in upper 2 feet.
3.5 - 10.0	Loose to medium dense, moist, gray SAND, trace gravel. Coarse SAND, with some gravel from 3.5 to 4.0, and from 6.0 to 7.0 feet.

Test pit terminated at approximately 10 feet
No caving observed
No seepage observed

Test Pit TP-112

Location: Approximately 1350 feet north of south end of west "Chelsea" trench
Approximate ground surface elevation: Unknown

0.0 - 0.75	Topsoil
0.75 - 2.5	Loose to medium dense, moist, tan, fine to medium SAND, trace silt, occasional root in upper 2 feet.
2.5 - 10.0	Loose to medium dense, moist, gray SAND, some gravel.

Test pit terminated at approximately 10 feet
No caving observed
No seepage observed

Date Excavated: January 31, 2002

Logged by: KSS

APPENDIX B

LABORATORY TESTING PROCEDURES AND RESULTS

APPENDIX B
LABORATORY TESTING PROCEDURES AND RESULTS
1-91M-13845-A

The following paragraphs describe our procedures associated with the laboratory tests that we conducted for this project. Graphical results of certain laboratory tests are enclosed in this appendix.

Visual Classification Procedures

Visual soil classifications were conducted on all samples in the field and on selected samples in our laboratory. All soils were classified in general accordance with the United Soil Classification System, which includes color, relative moisture content, primary soil type (based on grain size), and any accessory soil types. The resulting soil classifications are presented on the exploration logs contained in Appendix A.

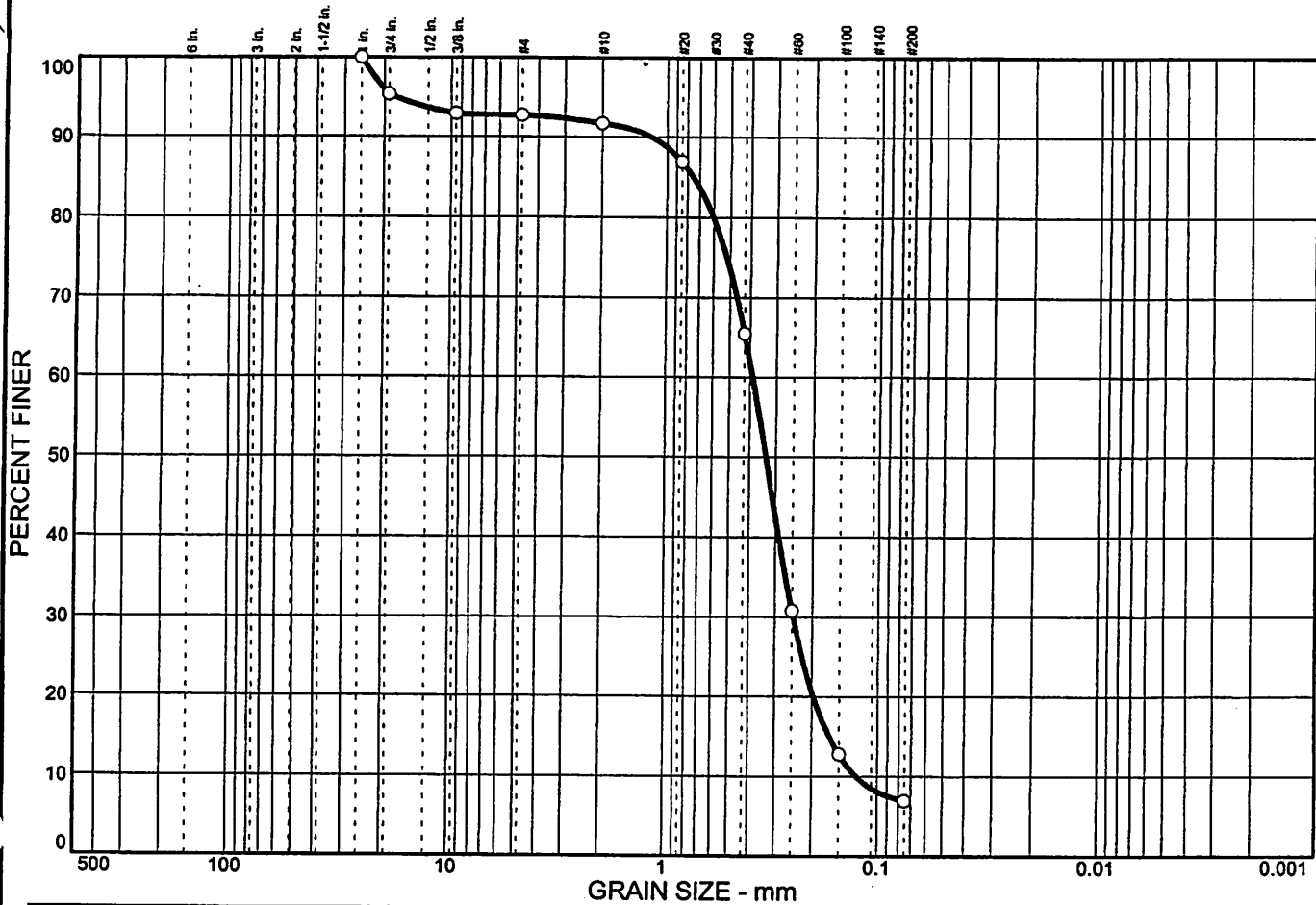
Moisture Content Determination Procedures

Moisture content determinations were performed on representative samples to aid in identification and correlation of soil types. All determinations were made in general accordance with ASTM:D-2216. The results of these tests are shown on the exploration logs contained in Appendix A.

Grain Size Analysis Procedures

A grain size analysis indicates the range of soil particle diameters included in a particular sample. Grain size analyses were performed on representative samples in general accordance with ASTM:D-422. The results of these tests are presented on the enclosed grain-size distribution graphs and were used in soil classifications shown on the exploration logs contained in Appendix A.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.3	85.8	6.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	95.3		
3/8 in.	92.9		
#4	92.7		
#10	91.7		
#20	86.9		
#40	65.5		
#60	30.8		
#100	12.8		
#200	6.9		

* (no specification provided)

Soil Description

Light Brown sand with some silt and gravel
Moisture=20.4%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.750 D₆₀= 0.388 D₅₀= 0.335
D₃₀= 0.246 D₁₅= 0.166 D₁₀= 0.125
C_u= 3.11 C_c= 1.25

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.1
Location: B-1, S-18

Source of Sample:

Date: 11/21/01
Elev./Depth: 28'

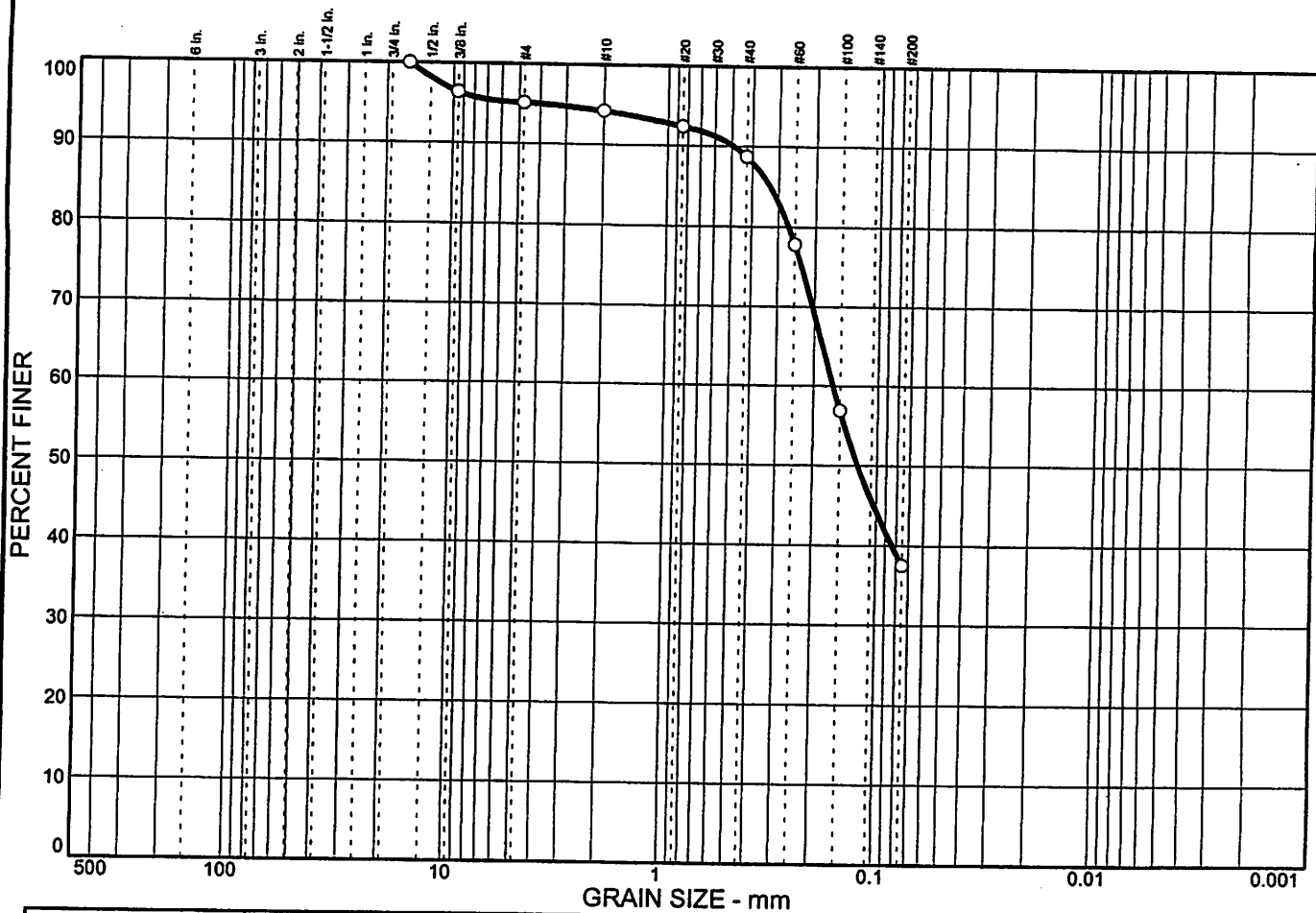


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.9	57.6	37.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8 in.	100.0		
3/8 in.	96.4		
#4	95.1		
#10	94.2		
#20	92.4		
#40	88.7		
#60	77.8		
#100	56.9		
#200	37.5		

* (no specification provided)

Soil Description
Gray silty sand trace gravel
Moisture=20.2%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.330 D₆₀= 0.162 D₅₀= 0.123
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification
USCS= AASHTO=

Remarks
Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.2
Location: B-1, S-29

Source of Sample:

Date: 11/21/01
Elev./Depth: 47'

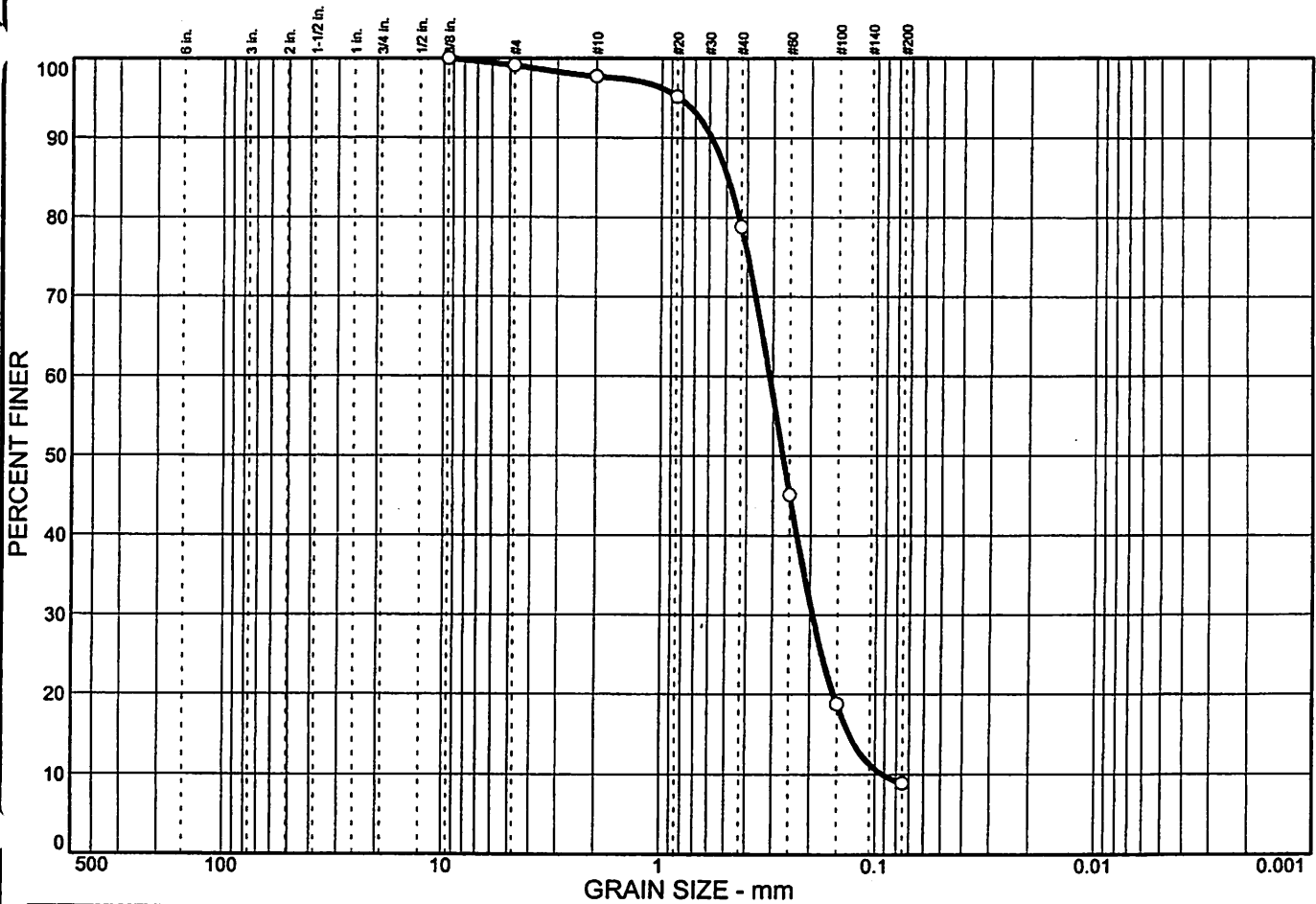


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.9	90.2	8.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.1		
#10	97.7		
#20	95.2		
#40	78.8		
#60	45.1		
#100	18.8		
#200	8.9		

* (no specification provided)

Soil Description
Light brown sand some silt
Moisture=21.4%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.492 D₆₀= 0.312 D₅₀= 0.269
D₃₀= 0.194 D₁₅= 0.131 D₁₀= 0.0920
C_u= 3.39 C_c= 1.31

Classification
USCS= AASHTO=

Remarks
Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.3
Location: B-2, S-11

Source of Sample:

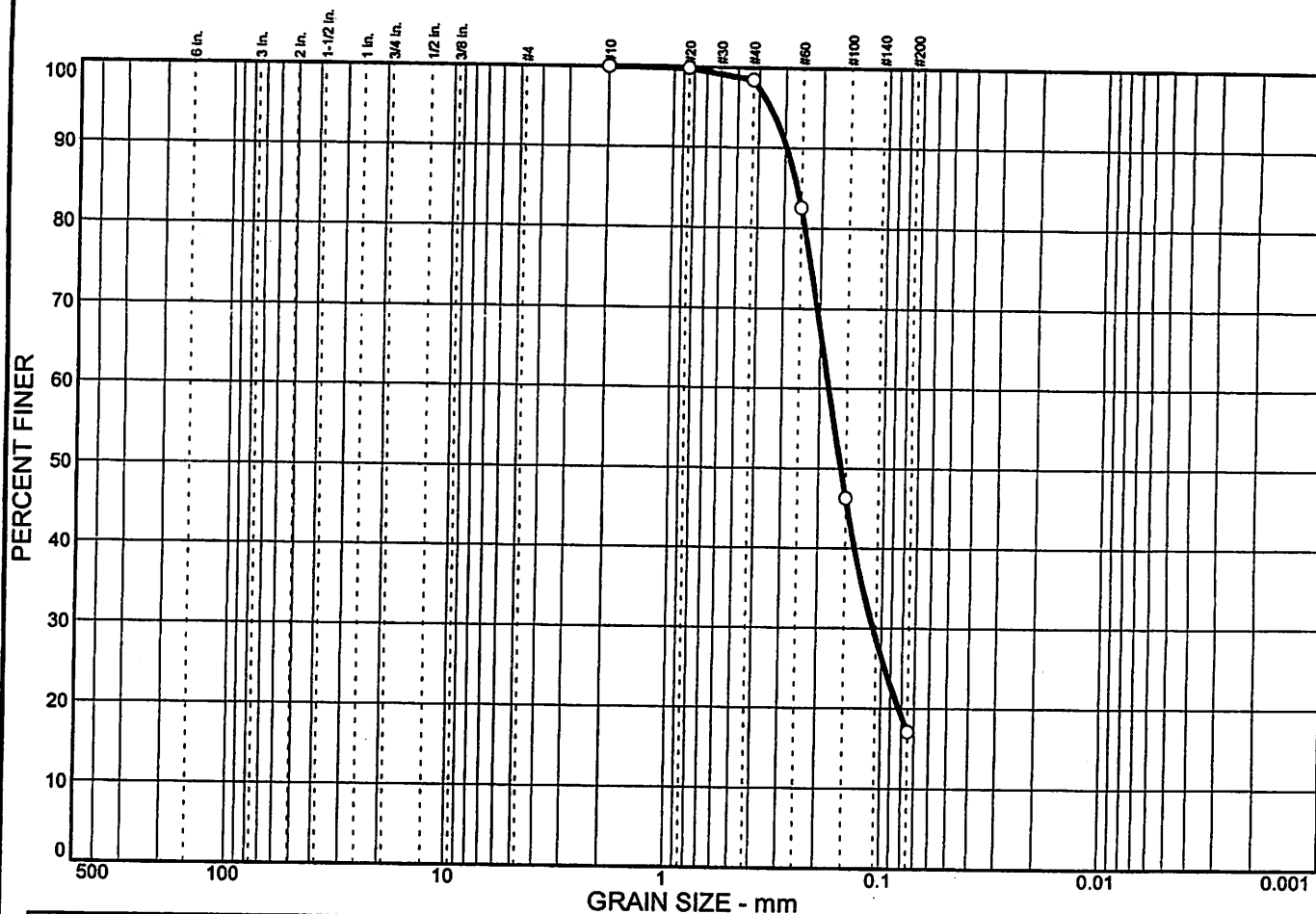
Date: 11/21/01
Elev./Depth: 17'



Client: Parametrix
Project: Tulalip Effluent Infiltration Project
Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	82.9	17.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	98.5		
#60	82.5		
#100	46.3		
#200	17.1		

* (no specification provided)

Soil Description

Light brown silty sand
Moisture=25.3%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.262 D₆₀= 0.181 D₅₀= 0.158
D₃₀= 0.110 D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.4
Location: B-2, S-24

Source of Sample:

Date: 11/21/01
Elev./Depth: 37.5'

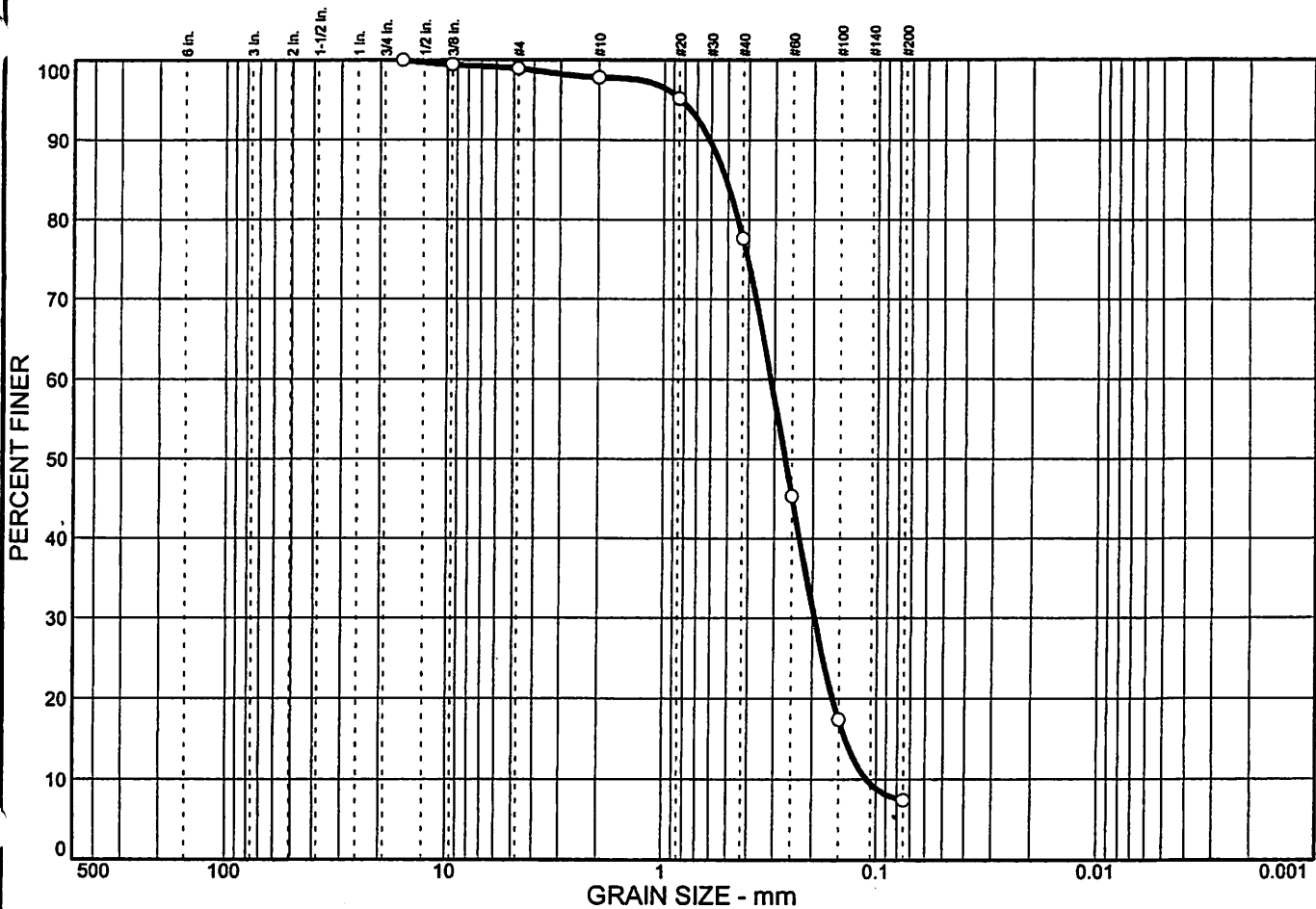


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	91.5	7.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8 in.	100.0		
3/8 in.	99.4		
#4	98.9		
#10	97.8		
#20	95.2		
#40	77.6		
#60	45.3		
#100	17.4		
#200	7.4		

* (no specification provided)

Soil Description
 Light brown sand some silt
 Moisture=9.5%

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₈₅= 0.510 D₆₀= 0.313 D₅₀= 0.268
 D₃₀= 0.195 D₁₅= 0.140 D₁₀= 0.110
 C_u= 2.83 C_c= 1.10

Classification
 USCS= AASHTO=

Remarks
 Tested by: SS/YY Reviewed by: ML
 ASTM: C136, D1140, D2216
 Sampled: 11/5-13/01

Sample No.: 4697.5
 Location: B-3, S-4

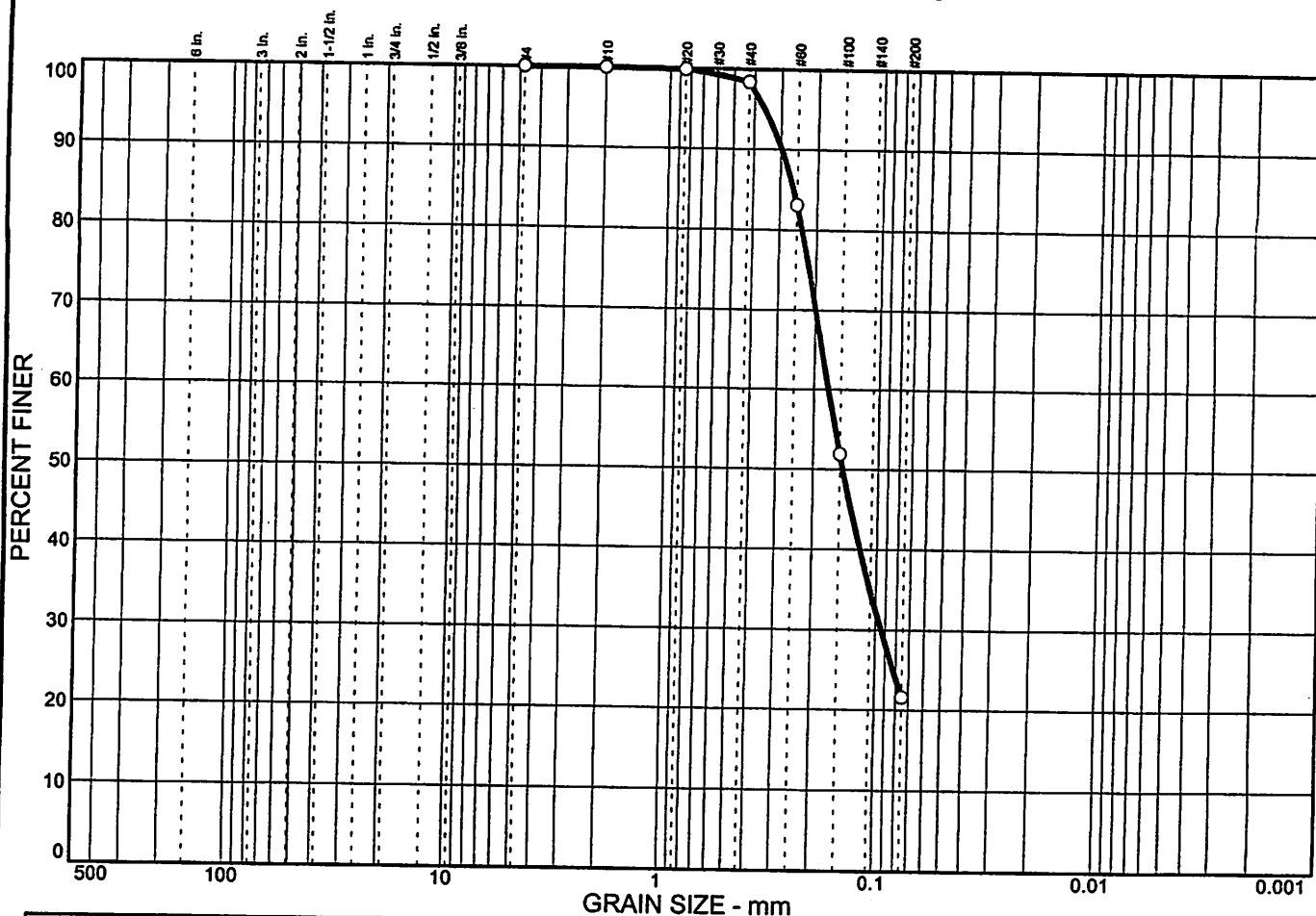
Source of Sample:

Date: 11/21/01
 Elev./Depth: 7'



Client: Parametrix
 Project: Tulalip Effluent Infiltration Project
 Project No: 1-91M-13845-A
 Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	78.4	21.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	98.4		
#60	83.1		
#100	51.9		
#200	21.6		

* (no specification provided)

Soil Description
 Light brown silty sand
 Moisture=21.1%

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₈₅= 0.261 D₆₀= 0.171 D₅₀= 0.145
 D₃₀= 0.0942 D₁₅= D₁₀=
 C_u= C_c=

Classification
 USCS= AASHTO=

Remarks
 Tested by: SS/YY Reviewed by: ML
 ASTM: C136, D1140, D2216
 Sampled: 11/5-13/01

Sample No.: 4697.6
Location: B-3, S-28

Source of Sample:

Date: 11/21/01
Elev./Depth: 44.5'



Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report

PERCENT FINER

GRAIN SIZE - mm

Sieve Size	Grain Size (mm)	Percent Finer (%)
3/8 in.	9.5	100.0
#4	4.75	100.0
#10	2.0	99.1
#20	0.85	98.7
#40	0.425	97.1
#60	0.25	87.5
#100	0.15	60.3
#200	0.075	41.4

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	57.8	41.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.2		
#10	99.1		
#20	98.7		
#40	97.1		
#60	87.5		
#100	60.3		
#200	41.4		

* (no specification provided)

Soil Description

Gray silty sand
Moisture=29.6%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.236 D₆₀= 0.149 D₅₀= 0.114
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.7
Location: B-4, S-7b

Source of Sample:

Date: 11/21/01
Elev./Depth: 12'

amec

Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	57.8	41.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.2		
#10	99.1		
#20	98.7		
#40	97.1		
#60	87.5		
#100	60.3		
#200	41.4		

* (no specification provided)

Soil Description

Gray silty sand
Moisture=29.6%

Atterberg Limits

PL=

$$LL =$$

PI=

Coefficients

$$D_{85} = 0.236$$
$$D_{60} = 0.149$$

$D_{50} = 0.114$

D₃₀=

D15=

D10=

$$C_H =$$
 C_{11}

Classification

USCS=

AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML

ASTM: C136, D1140, D2216

Sampled: 11/5-13/01

Sample No.: 4697.7
Location: B-4, S-7b

Source of Sample:

Date: 11/21/01
Elev./Depth: 12'



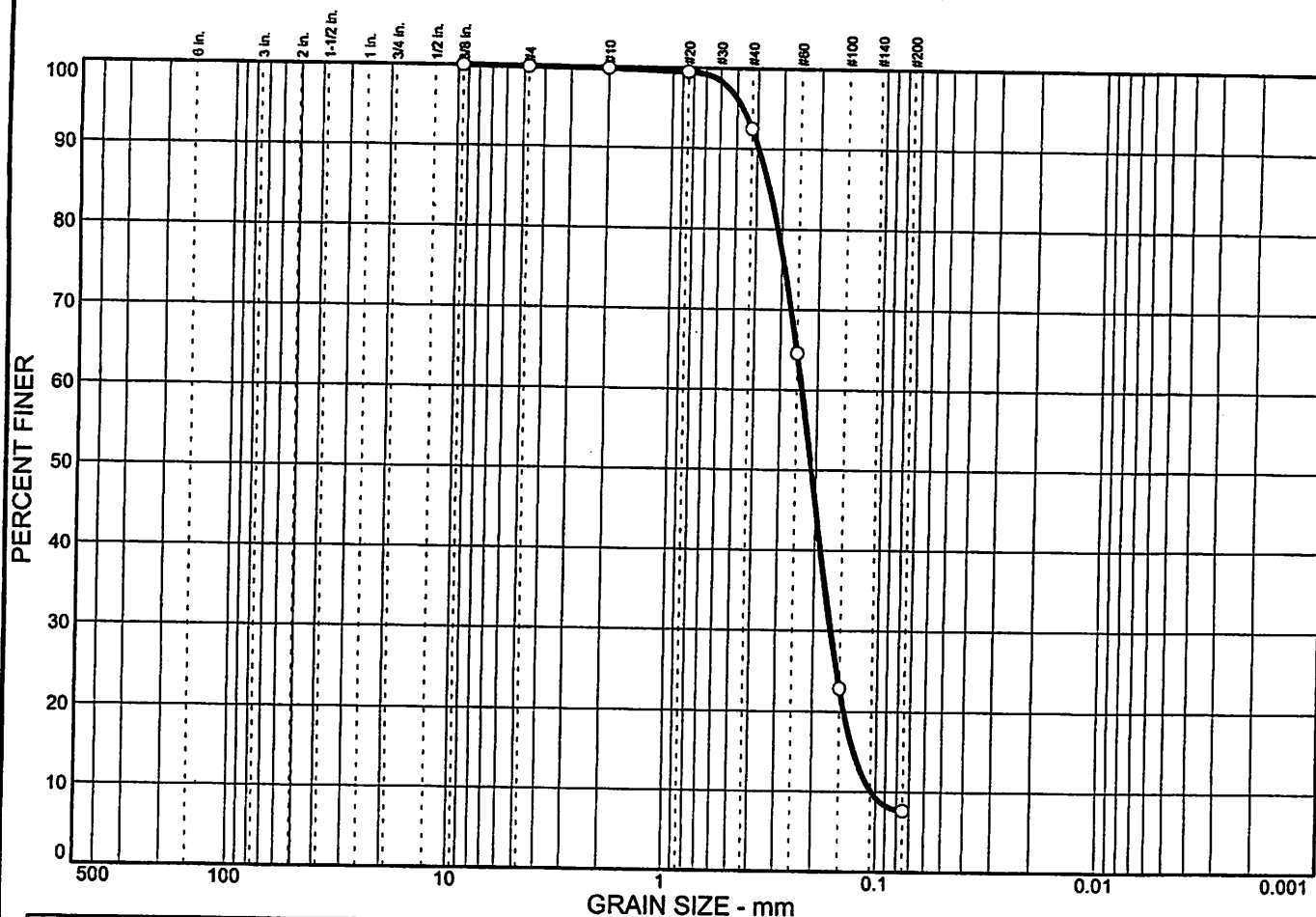
Client: Parametrix

Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	92.3	7.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.9		
#10	99.8		
#20	99.5		
#40	92.5		
#60	64.6		
#100	22.9		
#200	7.6		

* (no specification provided)

Soil Description
Gray sand some silt
Moisture=24.0%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.348 D₆₀= 0.236 D₅₀= 0.210
D₃₀= 0.166 D₁₅= 0.128 D₁₀= 0.105
C_u= 2.24 C_c= 1.11

Classification
USCS= AASHTO=

Remarks
Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.8
Location: B-4, S-24

Source of Sample:

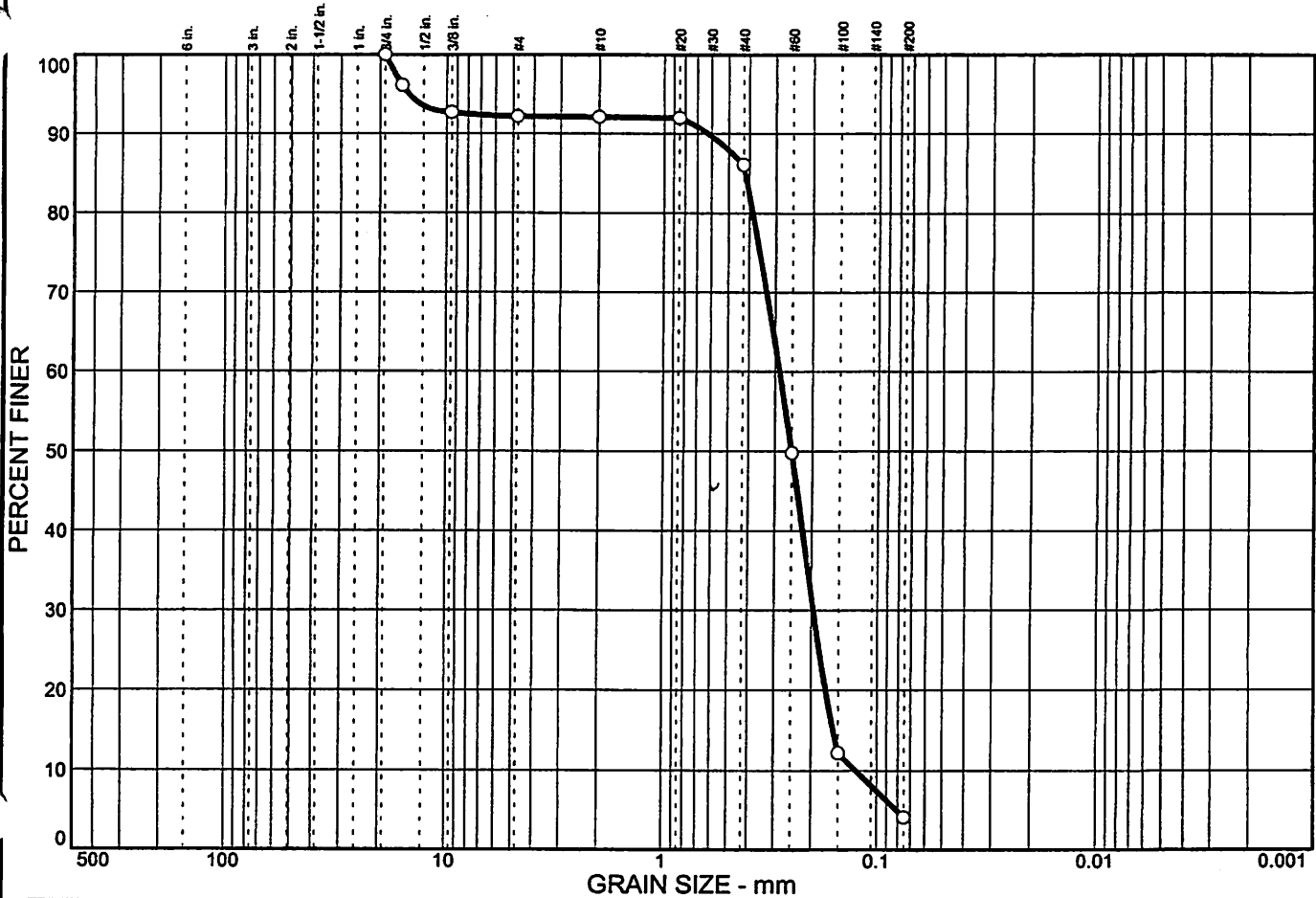
Date: 11/21/01
Elev./Depth: 37.5'

Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.8	88.1	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
5/8 in.	96.1		
3/8 in.	92.7		
#4	92.2		
#10	92.1		
#20	92.0		
#40	86.1		
#60	49.8		
#100	12.2		
#200	4.1		

* (no specification provided)

Soil Description

Gray sand some gravel trace silt
Moisture=24.5%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.418 D₆₀= 0.286 D₅₀= 0.251
D₃₀= 0.196 D₁₅= 0.158 D₁₀= 0.124
C_u= 2.30 C_c= 1.08

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ml
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.9
Location: B-5, S-12

Source of Sample:

Date: 11/21/01
Elev./Depth: 19'

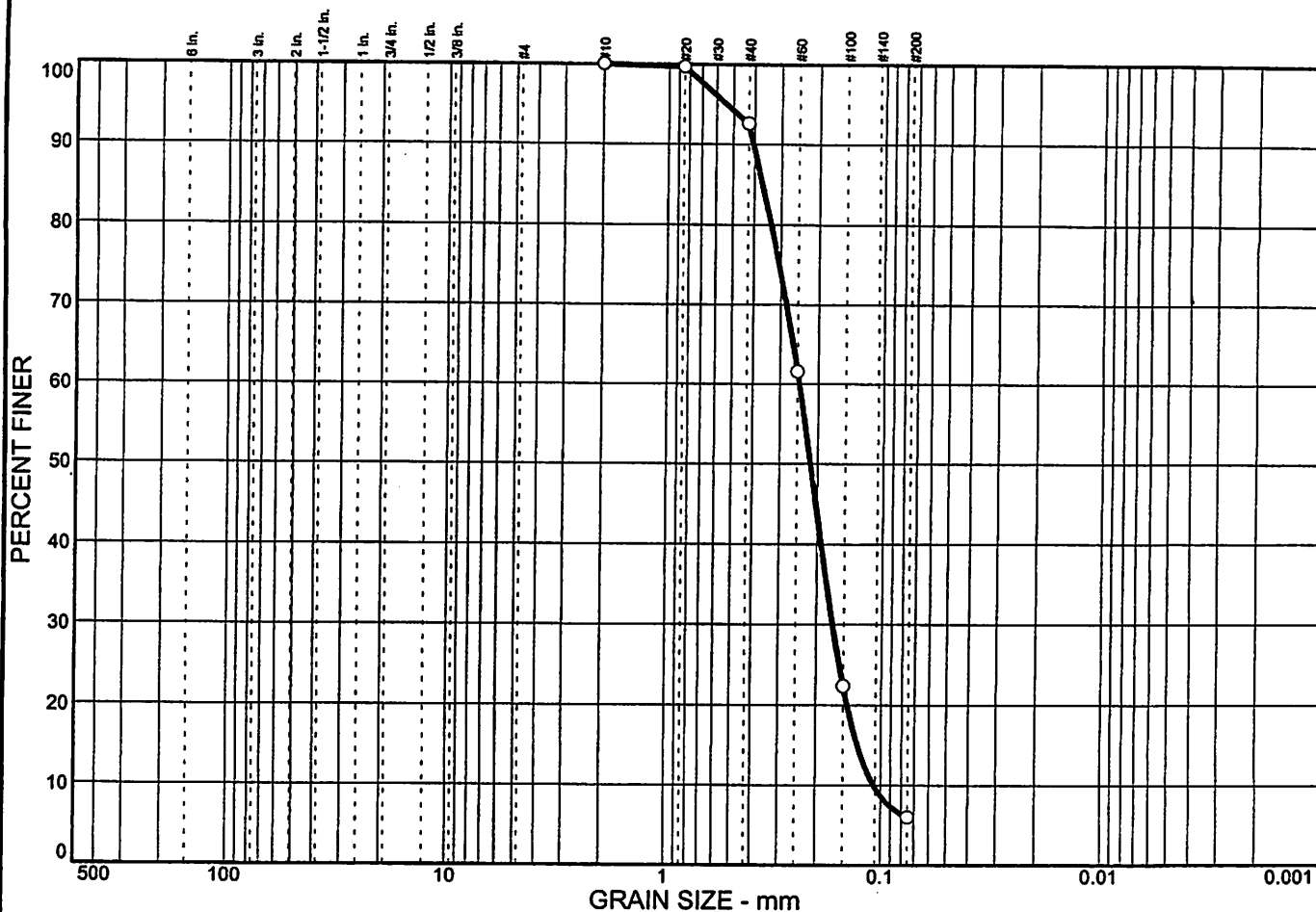


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	94.0	6.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	92.6		
#60	61.6		
#100	22.4		
#200	6.0		

* (no specification provided)

Soil Description
Gray sand some silt
Moisture=25.0%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.366 D₆₀= 0.245 D₅₀= 0.216
D₃₀= 0.168 D₁₅= 0.128 D₁₀= 0.108
C_u= 2.27 C_c= 1.07

Classification
USCS= AASHTO=

Remarks
Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.10
Location: B-5, S-24

Source of Sample:

Date: 11/21/01
Elev./Depth: 37'

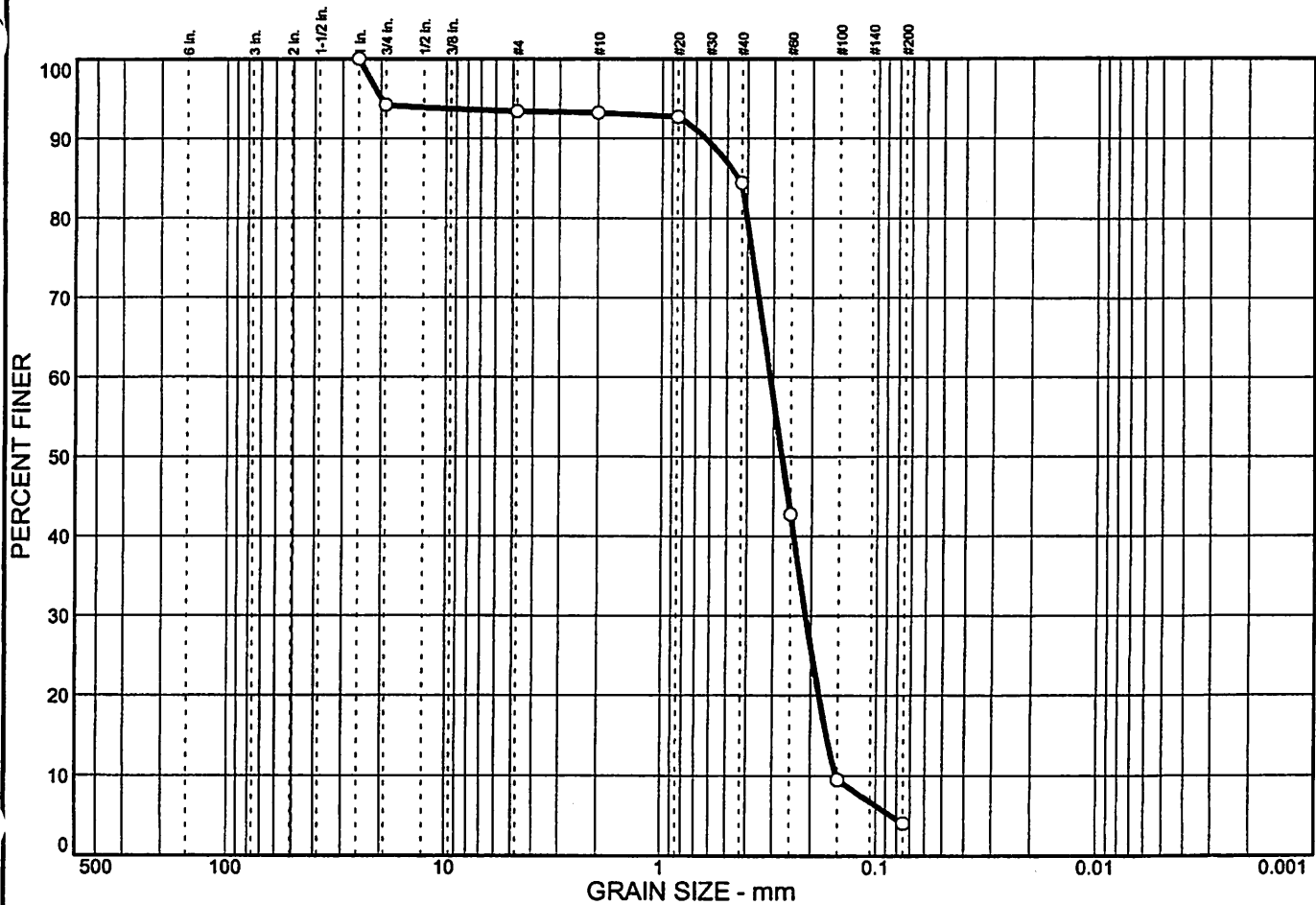


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	6.6	89.4	4.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
3/4 in.	94.2		
#4	93.4		
#10	93.2		
#20	92.7		
#40	84.4		
#60	42.7		
#100	9.5		
#200	4.0		

* (no specification provided)

Soil Description Gray sand some gravel trace silt Moisture=24.7%		
Atterberg Limits PL= LL= PI=		
Coefficients D ₈₅ = 0.440 D ₆₀ = 0.311 D ₅₀ = 0.274 D ₃₀ = 0.212 D ₁₅ = 0.168 D ₁₀ = 0.152 C _u = 2.05 C _c = 0.95		
Classification USCS= AASHTO=		
Remarks Tested by: SS/YY Reviewed by: ML ASTM: C136, D1140, D2216 Sampled: 11/5-13/01		

Sample No.: 4697.11
Location: B-6, S-9

Source of Sample:

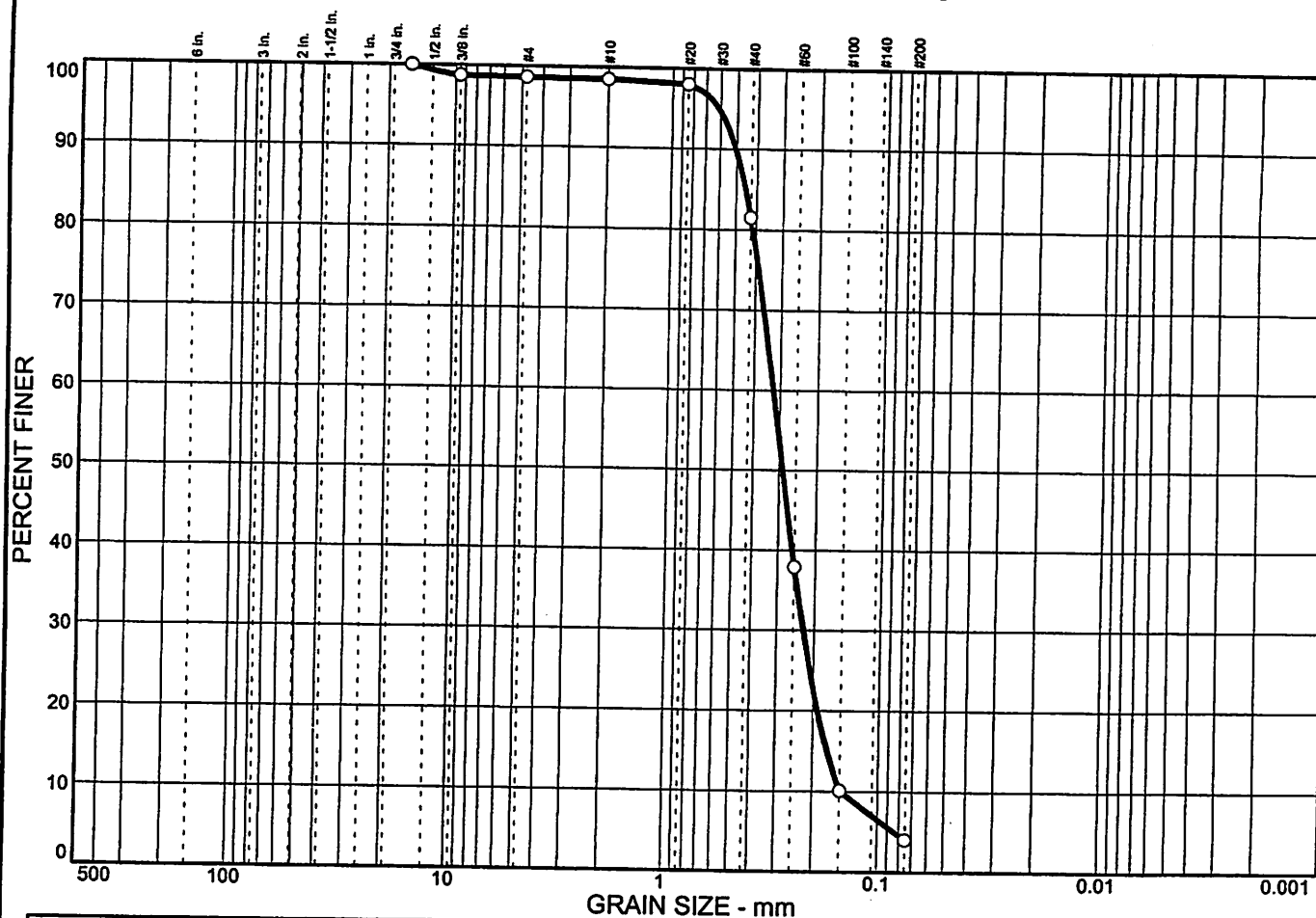
Date: 11/21/01
Elev./Depth: 14.5'



Client: Parametrix
Project: Tulalip Effluent Infiltration Project
Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	94.6	4.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5/8 in.	100.0		
3/8 in.	98.7		
#4	98.6		
#10	98.5		
#20	98.0		
#40	81.5		
#60	37.9		
#100	10.1		
#200	4.0		

* (no specification provided)

Soil Description

Gray sand trace silt
Moisture=24.5%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.452 D₆₀= 0.323 D₅₀= 0.288
D₃₀= 0.225 D₁₅= 0.172 D₁₀= 0.148
C_u= 2.18 C_c= 1.05

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.12
Location: B-6, S-15

Source of Sample:

Date: 11/21/01
Elev./Depth: 23.5'

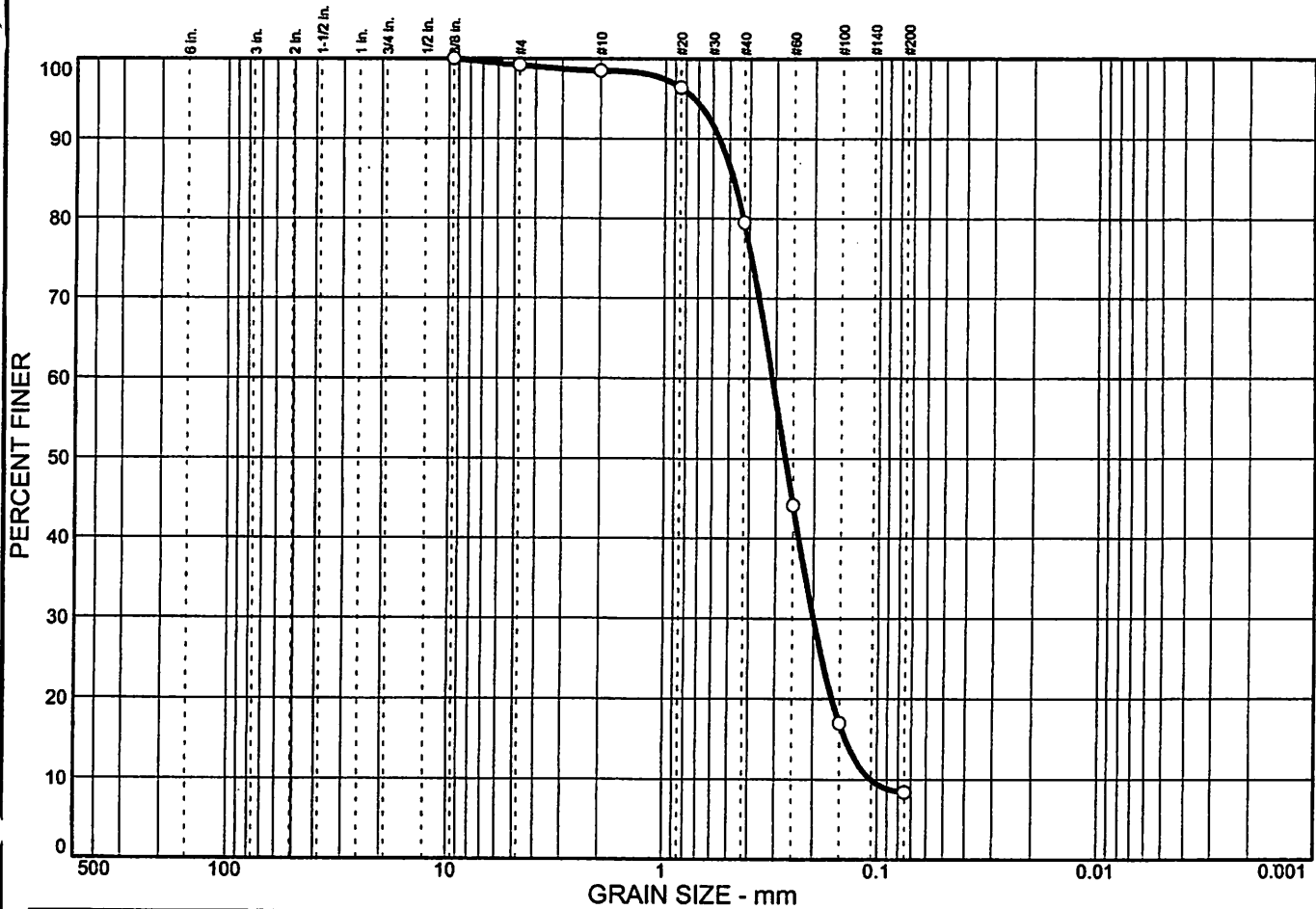


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.8	90.8	8.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.2		
#10	98.5		
#20	96.4		
#40	79.5		
#60	44.1		
#100	17.0		
#200	8.4		

(no specification provided)

Soil Description

Gray sand some silt
Moisture=22.8%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.480 D₆₀= 0.313 D₅₀= 0.272
D₃₀= 0.200 D₁₅= 0.141 D₁₀= 0.107
C_u= 2.93 C_c= 1.19

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.13
Location: B-7, S-7

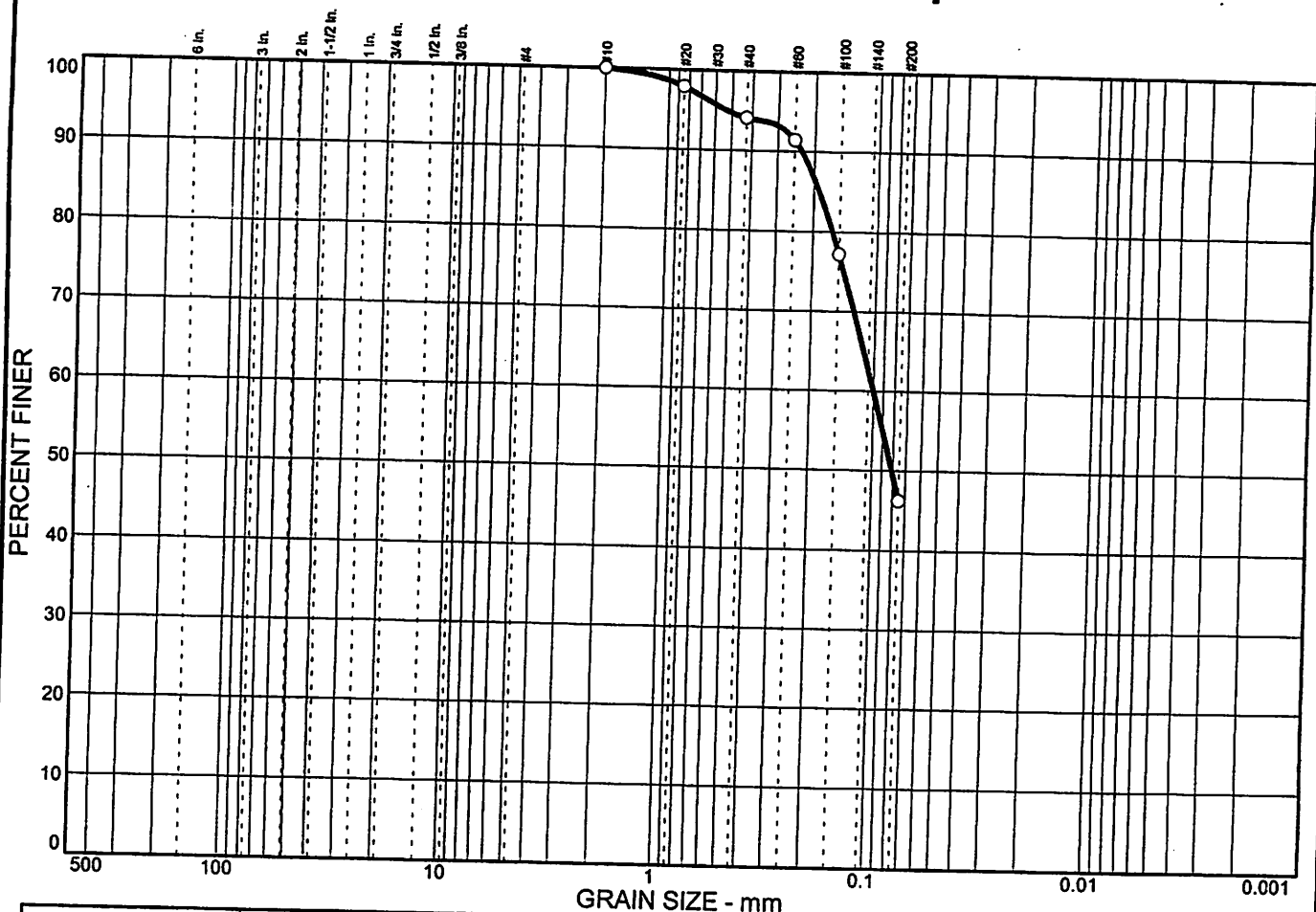
Source of Sample:

Date: 11/21/01
Elev./Depth: 11.5'



Client: Parametrix
Project: Tulalip Effluent Infiltration Project
Project No: 1-91M-13845-A
Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	53.8		46.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	97.9		
#40	94.1		
#60	91.4		
#100	77.2		
#200	46.2		

* (no specification provided)

Soil Description

Gray silty sand to sandy silt
Moisture=25.5%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.188 D₆₀= 0.100 D₅₀= 0.0812
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 11/5-13/01

Sample No.: 4697.14
Location: B-7, S-30

Source of Sample:

Date: 11/21/01
Elev./Depth: 47'

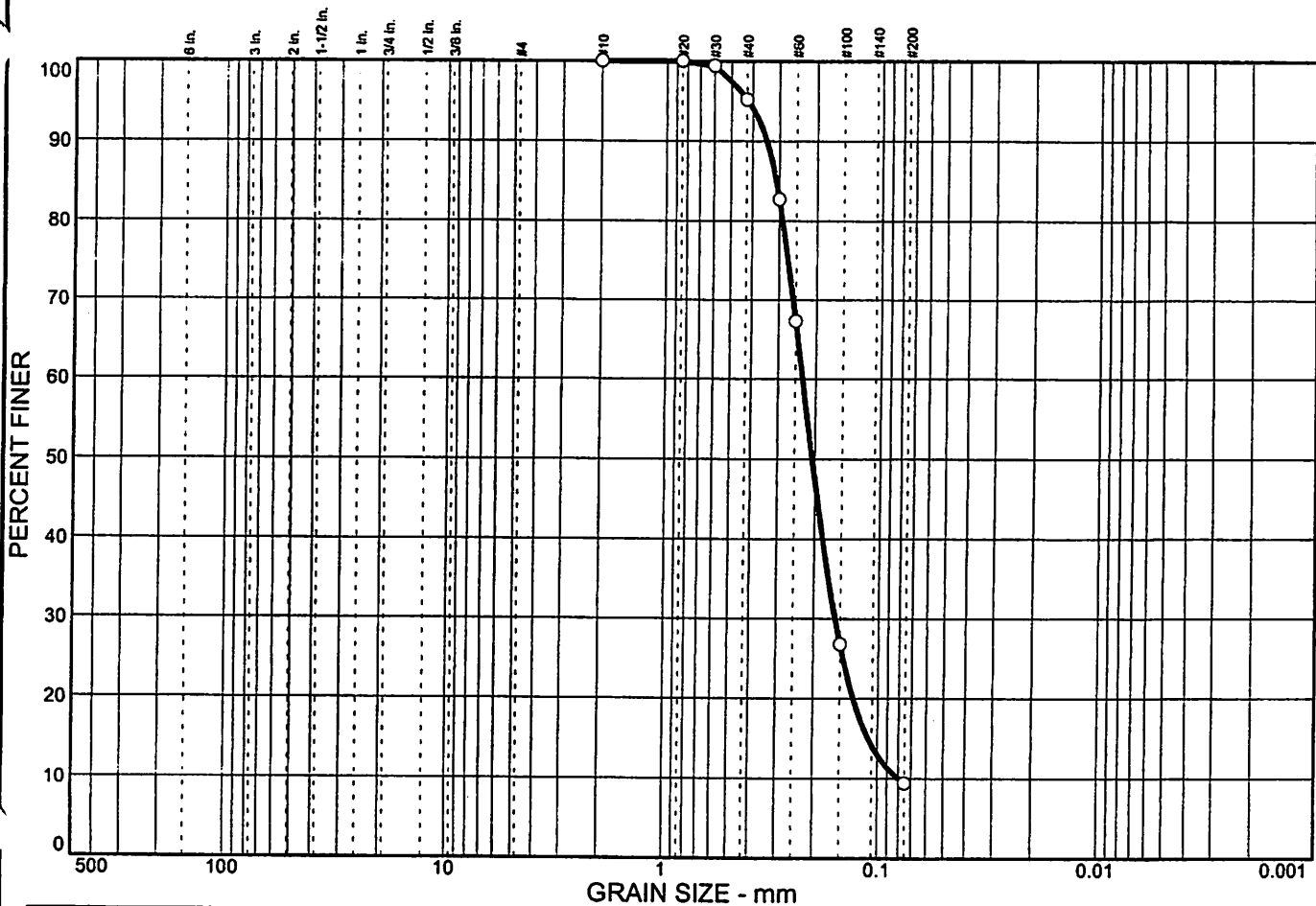


Client: Parametrix
Project: Tulalip Effluent Infiltration Project

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	90.6	9.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#30	99.4		
#40	95.2		
#50	82.7		
#60	67.3		
#100	26.8		
#200	9.4		

* (no specification provided)

Soil Description
Dark gray sand some silt
Moisture=25.8%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.311 D₆₀= 0.231 D₅₀= 0.206
D₃₀= 0.158 D₁₅= 0.110 D₁₀= 0.0797
C_u= 2.90 C_c= 1.36

Classification
USCS= AASHTO=

Remarks
Tested by: YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 12/07/01

Sample No.: 4745.1
Location: B-8, S-6

Source of Sample:

Date: 12/14/01
Elev./Depth: 22.5'



Client: Parametrix
Project: Tulalip Wastewater Plant

Project No: 1-91M-13845-A

Plate

The graph displays the grain size distribution of a sample. The y-axis represents the percentage of material finer than a given grain size, ranging from 0 to 100. The x-axis represents the grain size in millimeters on a logarithmic scale, ranging from 500 mm to 0.001 mm. The curve shows that approximately 100% of the sample is finer than 10 mm, and the distribution becomes increasingly steep as the grain size decreases below 1 mm. The data points are as follows:

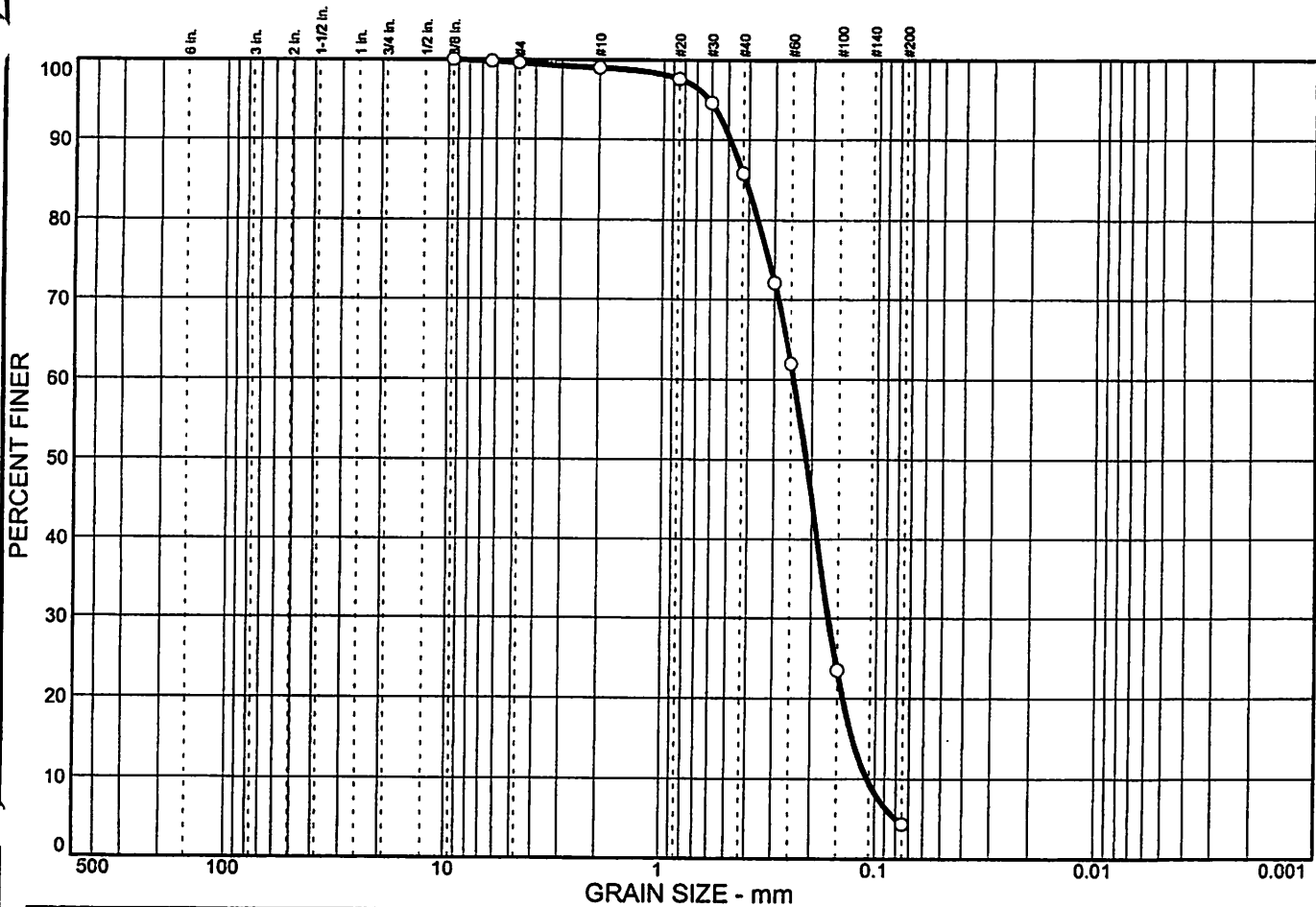
Grain Size (mm)	Percent Finer (%)
10	100
4.75	100
2.5	100
1.18	100
0.85	98
0.6	92
0.425	73
0.3	47
0.25	31
0.15	10
0.075	3

<u>Soil Description</u>		
Gray sand trace fines		
Moisture=26.4%		
<u>Atterberg Limits</u>		
PL=	LL=	PI=
<u>Coefficients</u>		
D ₈₅ = 0.511	D ₆₀ = 0.348	D ₅₀ = 0.307
D ₃₀ = 0.243	D ₁₅ = 0.177	D ₁₀ = 0.137
C _u = 2.53	C _c = 1.24	
<u>Classification</u>		
USCS=	AASHTO=	
<u>Remarks</u>		
Tested by: YY Reviewed by: ML		
ASTM: C136, D1140, D2216		
Sampled: 12/07/01		

amec

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.4	95.3	4.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
1/4 in.	99.8		
#4	99.6		
#10	99.0		
#20	97.6		
#30	94.6		
#40	85.8		
#50	72.1		
#60	62.0		
#100	23.5		
#200	4.3		

* (no specification provided)

Soil Description
Gray sand trace silt
Moisture=14.3%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.415 D₆₀= 0.243 D₅₀= 0.212
D₃₀= 0.165 D₁₅= 0.127 D₁₀= 0.108
C_u= 2.24 C_c= 1.04

Classification
USCS= AASHTO=

Remarks
Tested by: YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 12/07/01

Sample No.: 4745.3

Source of Sample:

Location: I-1, S-1 Pond Bottom

Date: 12/13/01

Elev./Depth: 3'



Client: Parametrix

Project: Tulalip Wastewater Plant

Project No: 1-91M-13845-A

Plate

The graph displays the grain size distribution of a soil sample. The y-axis represents the percentage of soil finer than a given grain size, ranging from 0 to 100. The x-axis represents the grain size in millimeters on a logarithmic scale, ranging from 500 mm to 0.001 mm. The curve shows that 100% of the soil is finer than 0.075 mm. The distribution is as follows:

Grain Size (mm)	Percent Finer (%)
0.075	100
0.06	62
0.0475	45
0.03	18
0.02	5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4 in.	100.0		
#4	99.9		
#10	99.9		
#20	99.3		
#30	96.8		
#40	85.0		
#50	62.1		
#60	45.6		
#100	18.4		
#200	6.4		

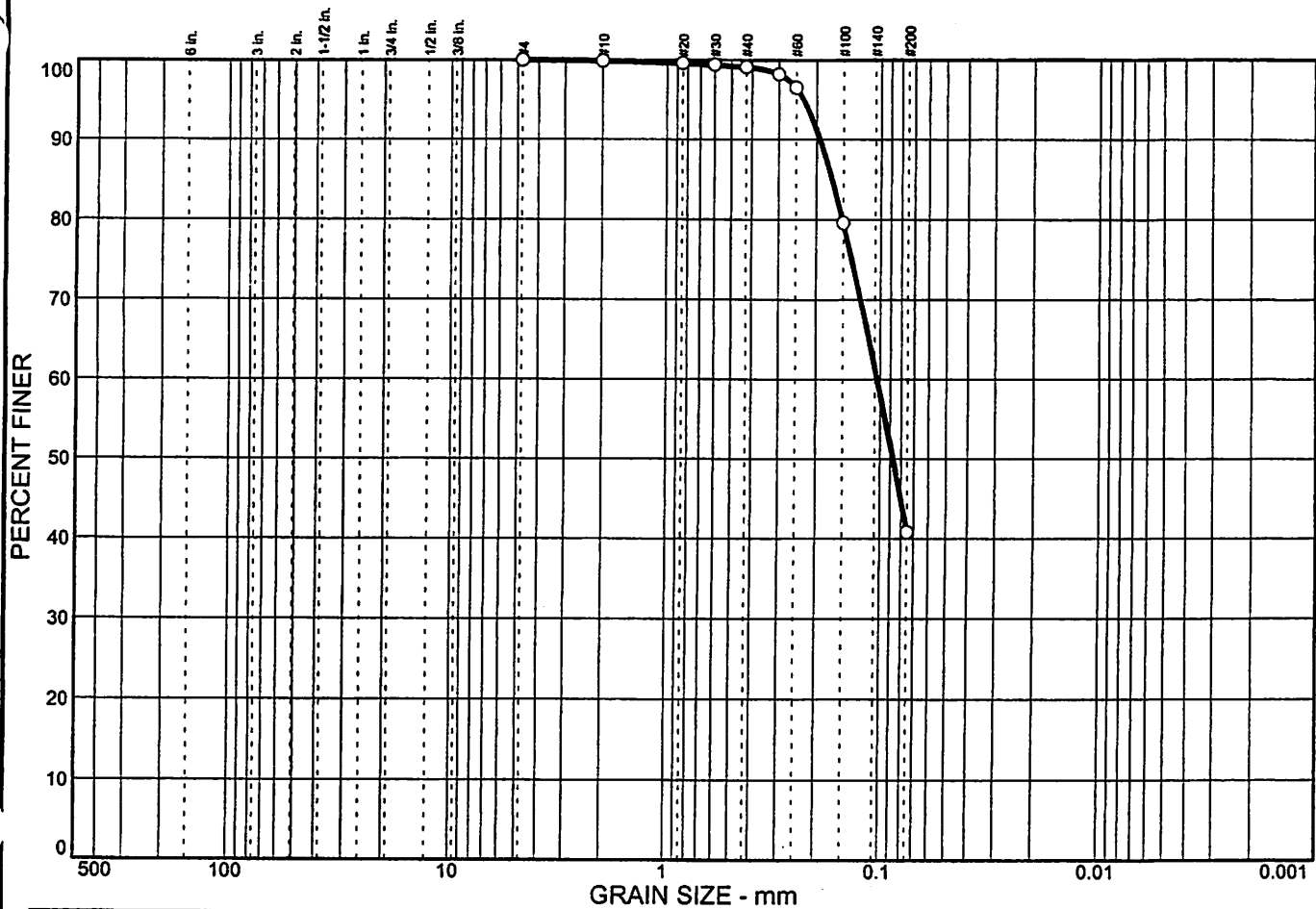
<u>Soil Description</u>		
Gray sand trace silt		
Moisture=10.6%		
<u>Atterberg Limits</u>		
PL=	LL=	PI=
<u>Coefficients</u>		
D ₈₅ = 0.425	D ₆₀ = 0.293	D ₅₀ = 0.263
D ₃₀ = 0.199	D ₁₅ = 0.132	D ₁₀ = 0.101
C _u = 2.90	C _c = 1.34	
<u>Classification</u>		
USCS=	AASHTO=	
<u>Remarks</u>		
Tested by: YY Reviewed by: ML		
ASTM: C136, D1140, D2216		
Sampled: 12/07/01		

Elev./Depth: 3'



Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	59.2	40.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.6		
#30	99.4		
#40	99.1		
#50	98.2		
#60	96.5		
#100	79.6		
#200	40.8		

* (no specification provided)

Soil Description

Gray silty sand
Moisture=35.3%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.169 D₆₀= 0.104 D₅₀= 0.0874
D₃₀= D₁₅= D₁₀=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Tested by: YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 12/07/01

Sample No.: 4745.6

Location: I-5, S-1

Source of Sample:

Date: 12/14/01

Elev./Depth: 3'

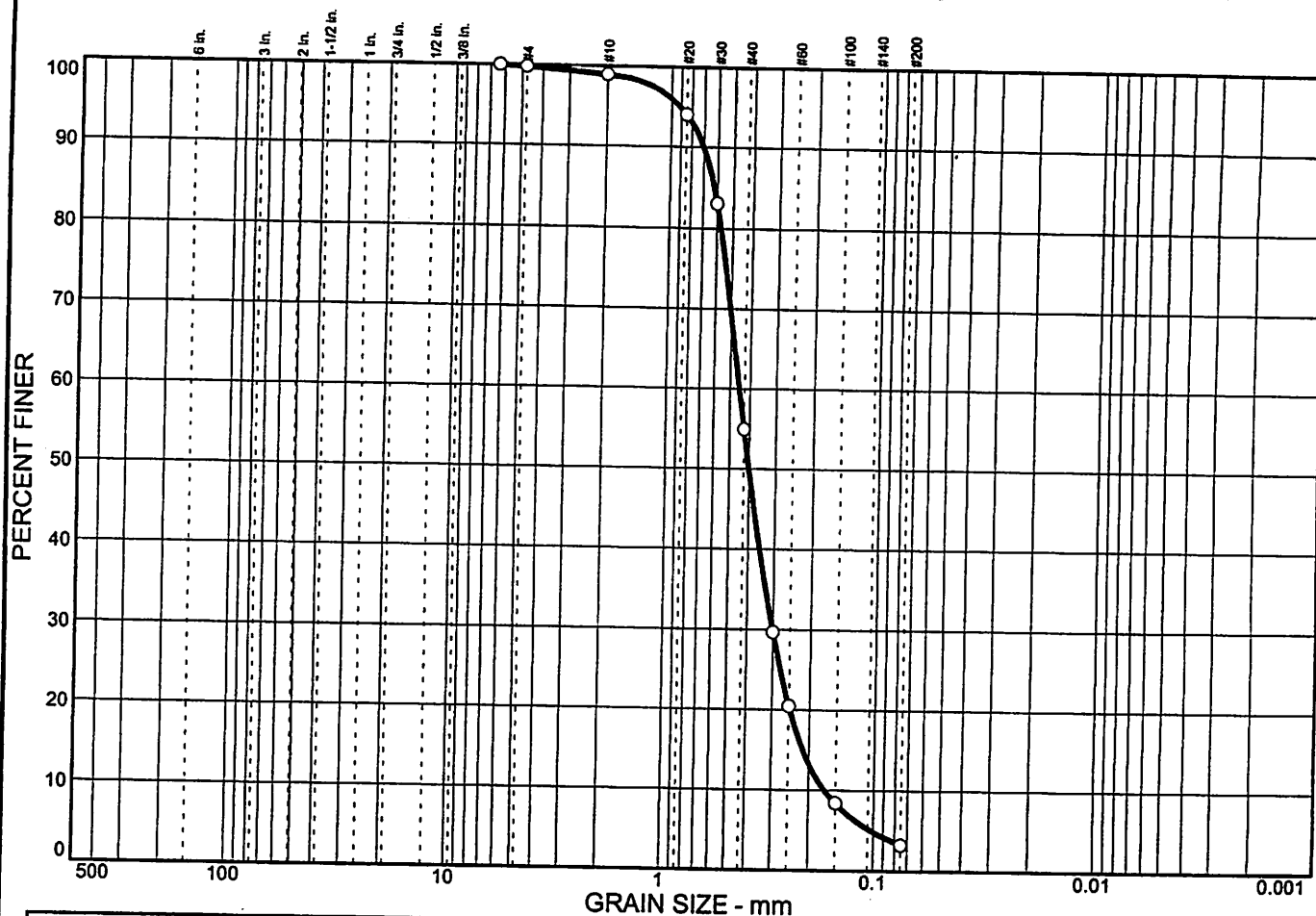


Client: Parametrix
Project: Tulalip Wastewater Plant

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	96.6	3.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4 in.	100.0		
#4	99.8		
#10	98.9		
#20	94.0		
#30	83.1		
#40	54.9		
#50	29.7		
#60	20.5		
#100	8.4		
#200	3.2		

* (no specification provided)

Soil Description

Gray sand trace silt
Moisture=12.7%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.621 D₆₀= 0.450 D₅₀= 0.401
D₃₀= 0.302 D₁₅= 0.214 D₁₀= 0.169
C_u= 2.67 C_c= 1.20

Classification

USCS= AASHTO=

Remarks

Tested by: YY Reviewed by: ML
ASTM: C136, D1140, D2216
Sampled: 12/07/01

Sample No.: 4745.5

Source of Sample:

Location: I-4, S-1 Bottom of Pond

Date: 12/13/01

Elev./Depth: 4'

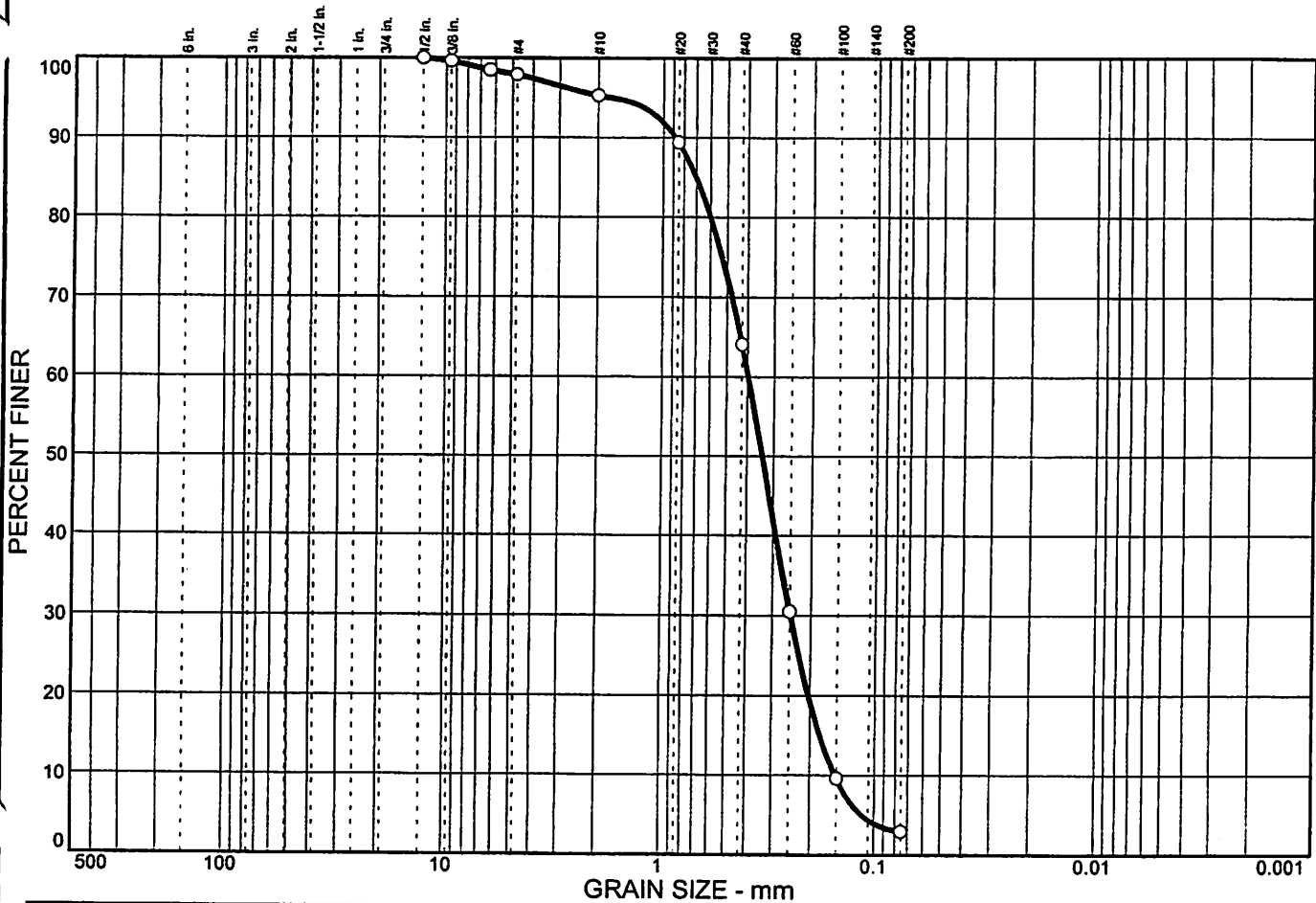


Client: Parametrix
Project: Tulalip Wastewater Plant

Project No: 1-91M-13845-A

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.1	95.0	2.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.6		
1/4 in.	98.5		
#4	97.9		
#10	95.3		
#20	89.4		
#40	64.1		
#60	30.5		
#100	9.6		
#200	2.9		

* (no specification provided)

Soil Description
Gray and black sand
Moisture=7.0%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.702 D₆₀= 0.397 D₅₀= 0.339
D₃₀= 0.248 D₁₅= 0.179 D₁₀= 0.152
C_u= 2.60 C_c= 1.02

Classification
USCS= SP AASHTO=

Remarks
Tested by: SS/YY Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.1
Location: TP-101, S-2

Source of Sample:

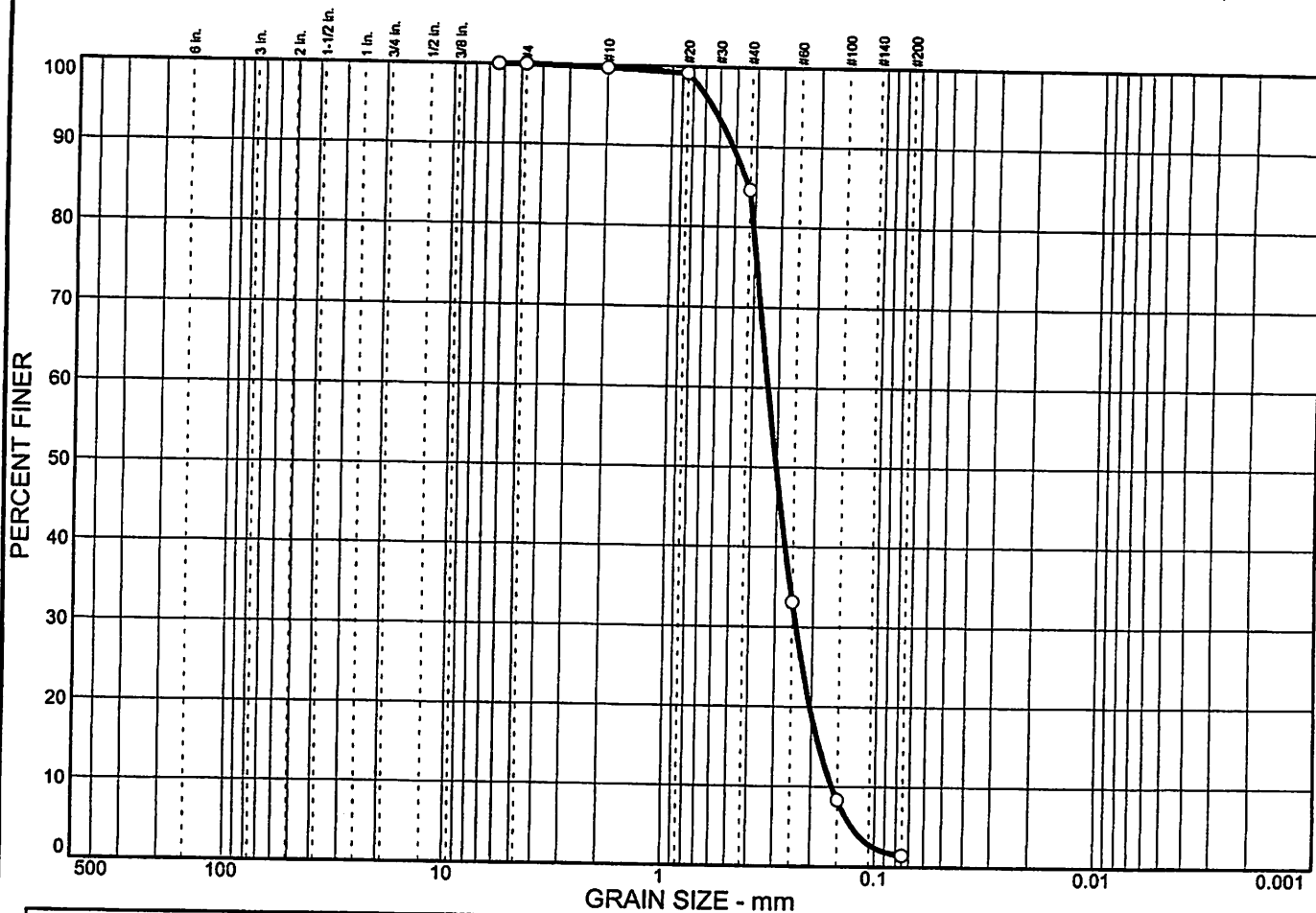
Date: 2/07/02
Elev./Depth: 2'



Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip
Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	98.6		1.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4 in.	100.0		
#4	100.0		
#10	99.7		
#20	99.2		
#40	84.6		
#60	33.1		
#100	8.3		
#200	1.4		

* (no specification provided)

Soil Description
Gray and black sand
Moisture=5.8%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 0.431 D₆₀= 0.336 D₅₀= 0.303
D₃₀= 0.240 D₁₅= 0.183 D₁₀= 0.159
C_u= 2.11 C_c= 1.07

Classification
USCS= SP AASHTO=

Remarks
Tested by: SS/YY Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.2
Location: TP-102, S-3

Source of Sample:

Date: 2/06/02
Elev./Depth: 9'

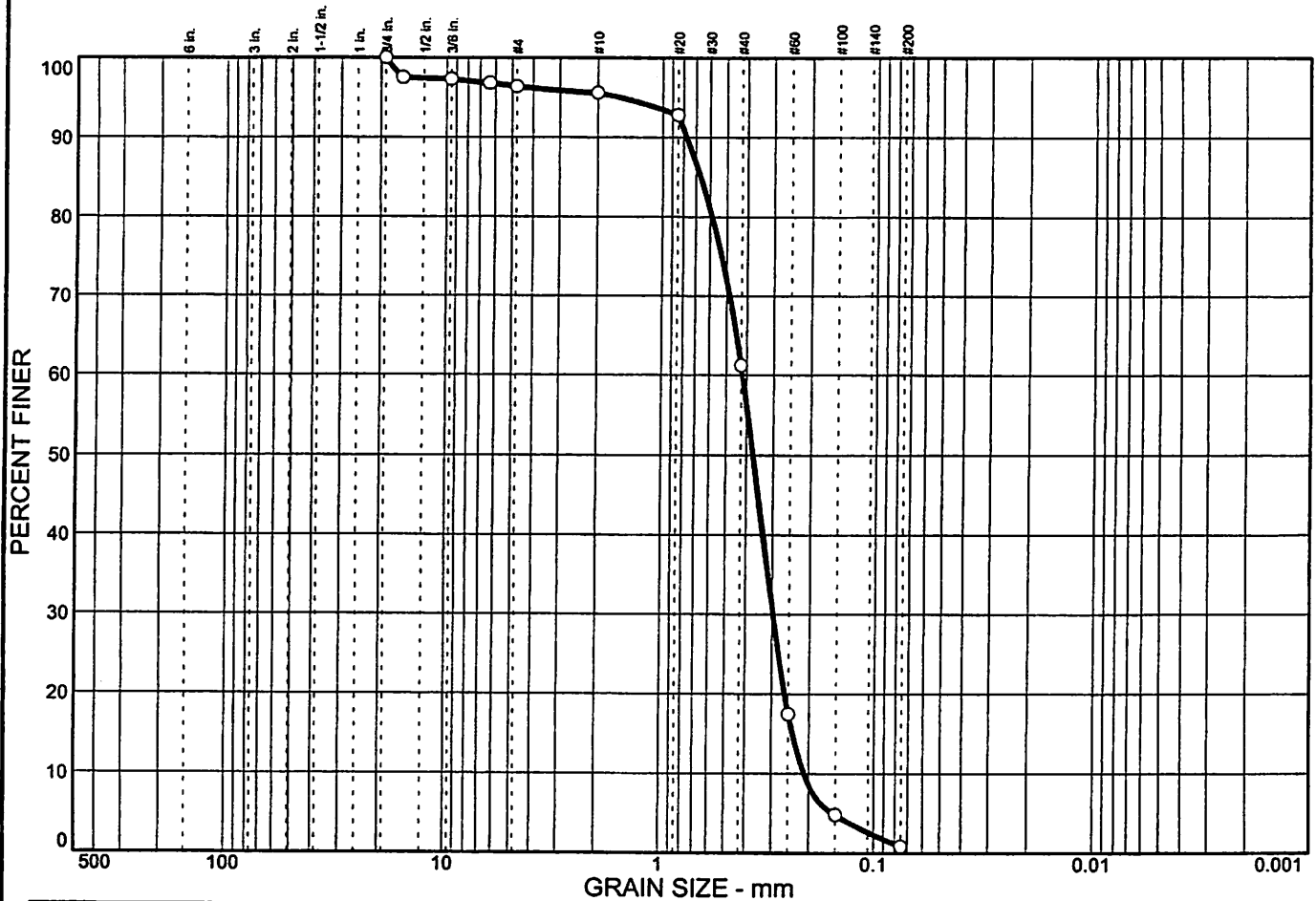


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.6	95.6	0.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
5/8 in.	97.5		
3/8 in.	97.3		
1/4 in.	96.8		
#4	96.4		
#10	95.6		
#20	92.8		
#40	61.2		
#60	17.5		
#100	4.8		
#200	0.8		

* (no specification provided)

Soil Description

Gray and black sand trace gravel
Moisture=6.4%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.666 D₆₀= 0.418 D₅₀= 0.372
D₃₀= 0.297 D₁₅= 0.239 D₁₀= 0.211
C_u= 1.99 C_c= 1.00

Classification

USCS= SP AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
STM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.3
Location: TP-103, S-1

Source of Sample:

Date: 2/06/02
Elev./Depth: 5'

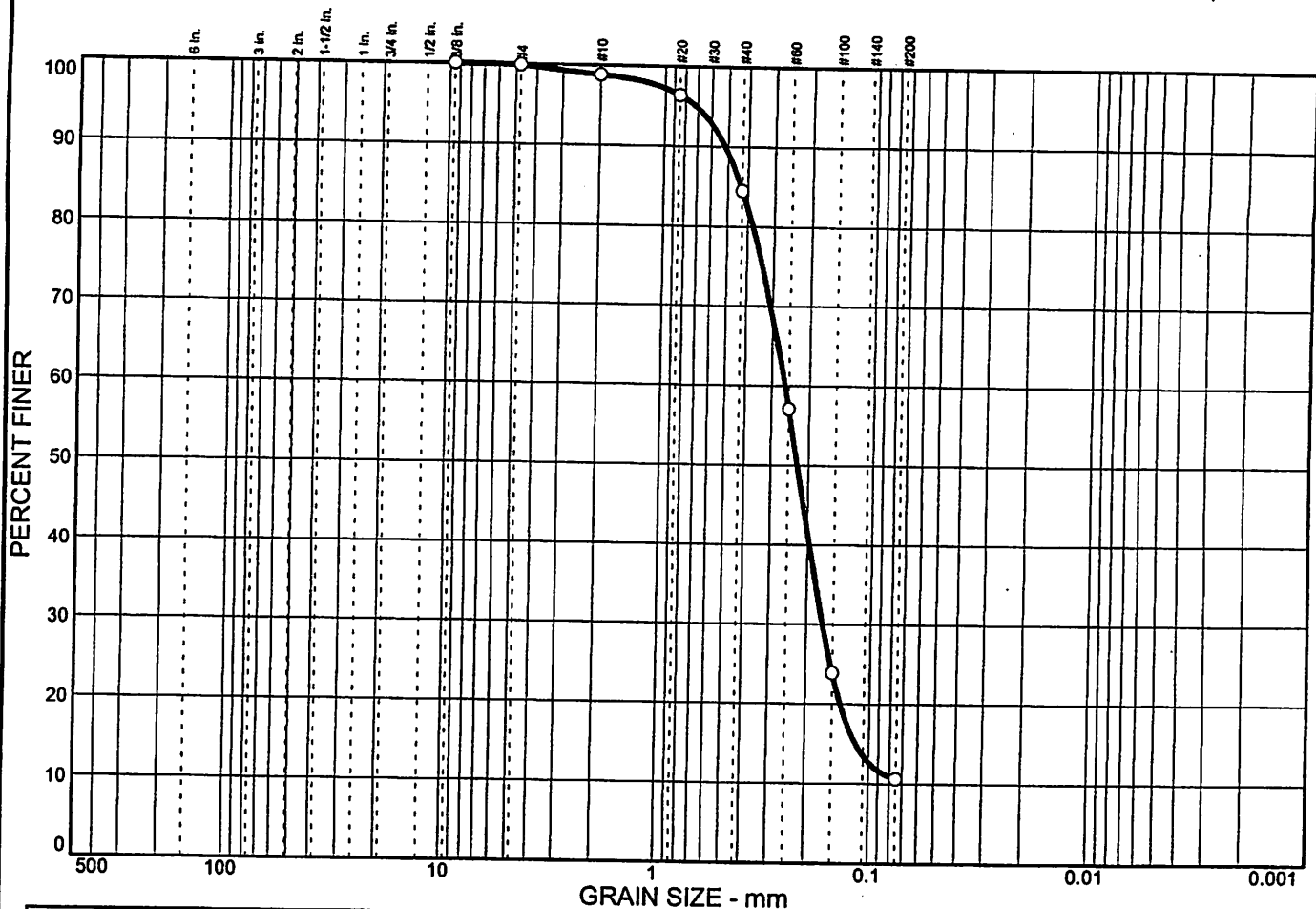


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	89.3	10.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.9		
#10	98.8		
#20	96.4		
#40	84.5		
#60	57.1		
#100	23.9		
#200	10.6		

* (no specification provided)

Soil Description

Reddish brown sand some silt
Moisture=16.9%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.431 D₆₀= 0.261 D₅₀= 0.226
D₃₀= 0.168 D₁₅= 0.115 D₁₀=
C_u= C_c=

Classification

USCS= SP-SM AASHTO=

Remarks

Tested by: SS/JW Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.4
Location: TP-105, S-1

Source of Sample:

Date: 2/07/02
Elev./Depth: 2'

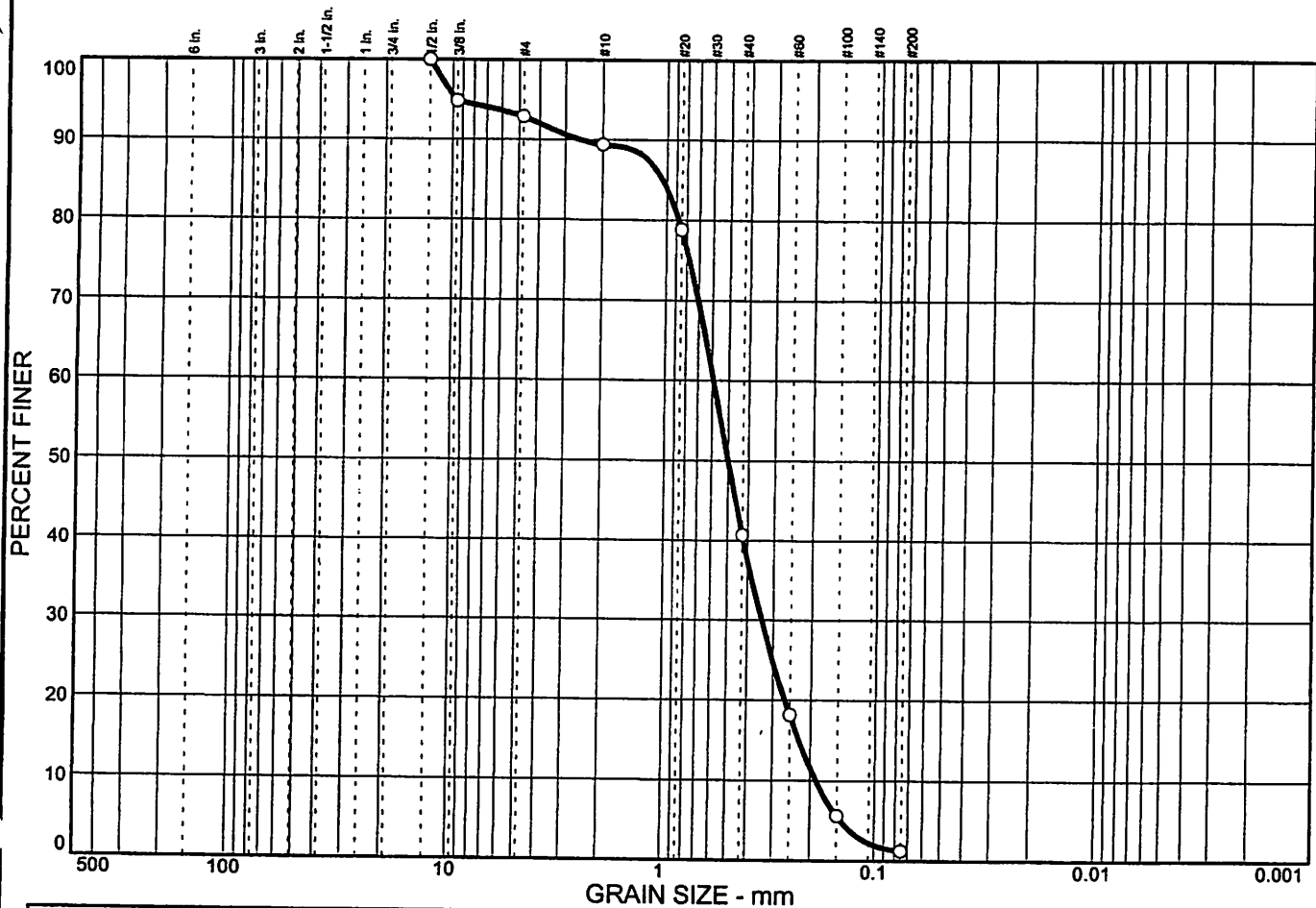


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.1	91.7	1.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	94.8		
#4	92.9		
#10	89.4		
#20	78.8		
#40	40.7		
#60	18.2		
#100	5.6		
#200	1.2		

* (no specification provided)

Soil Description
Black and gray sand some gravel
Moisture=6.1%

Atterberg Limits
PL= LL= PI=

Coefficients
D₈₅= 1.05 D₆₀= 0.590 D₅₀= 0.500
D₃₀= 0.341 D₁₅= 0.226 D₁₀= 0.187
C_u= 3.15 C_c= 1.05

Classification
USCS= SP AASHTO=

Remarks
Tested by: SS/JW Reviewed by: ML
ASTM: C136-96a, C1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.5
Location: TP-106, S-1

Source of Sample:

Date: 2/07/02
Elev./Depth: 4'

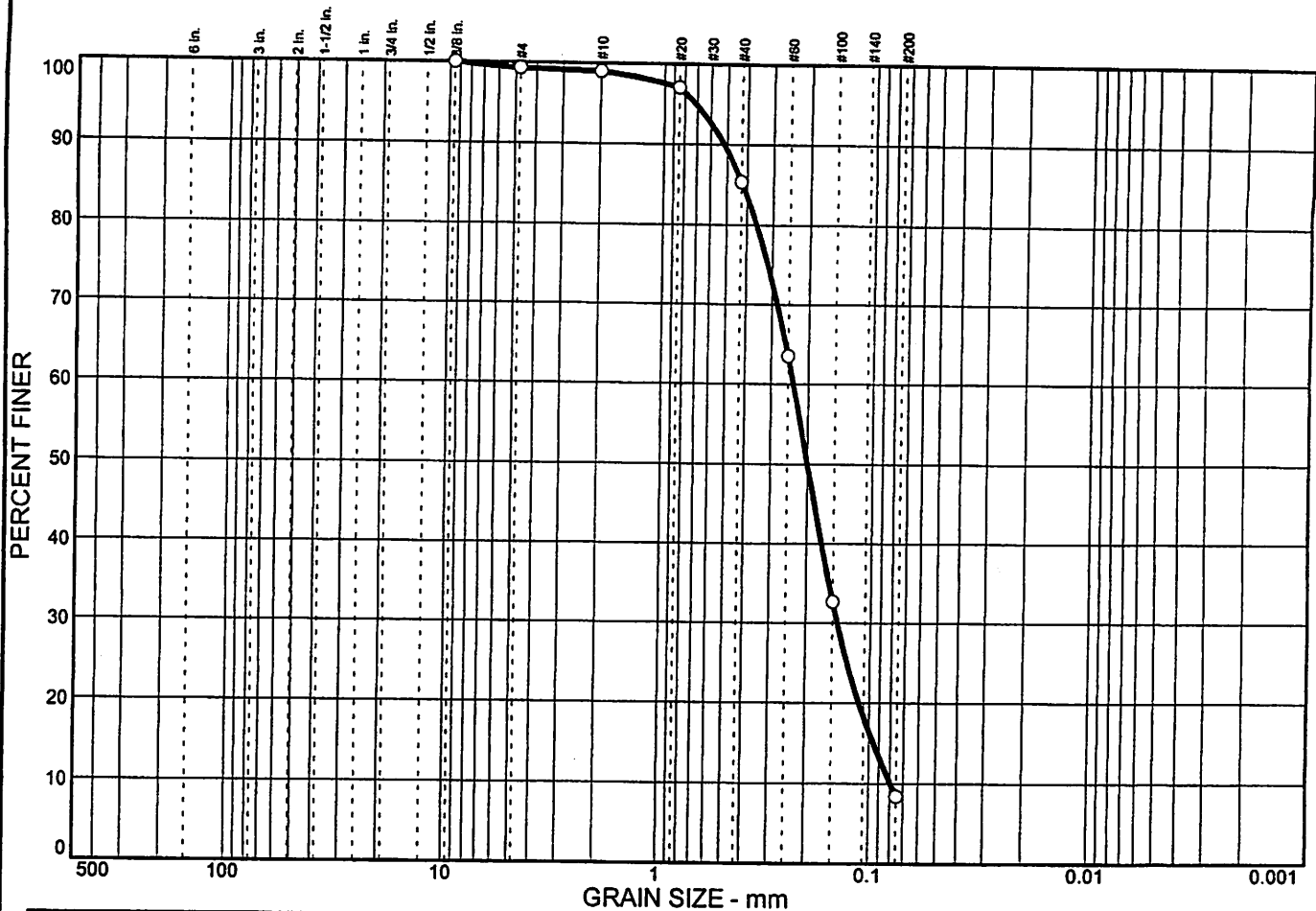


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.7	90.9		8.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.3		
#10	99.0		
#20	97.1		
#40	85.4		
#60	63.5		
#100	32.7		
#200	8.4		

* (no specification provided)

Soil Description

Light brown sand some silt
Moisture=8.7%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.419 D₆₀= 0.235 D₅₀= 0.200
D₃₀= 0.142 D₁₅= 0.0955 D₁₀= 0.0797
C_u= 2.95 C_c= 1.08

Classification

USCS= SP-SM AASHTO=

Remarks

Tested by: SS/JW Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.6
Location: TP-107, S-2

Source of Sample:

Date: 2/07/02
Elev./Depth: 3'

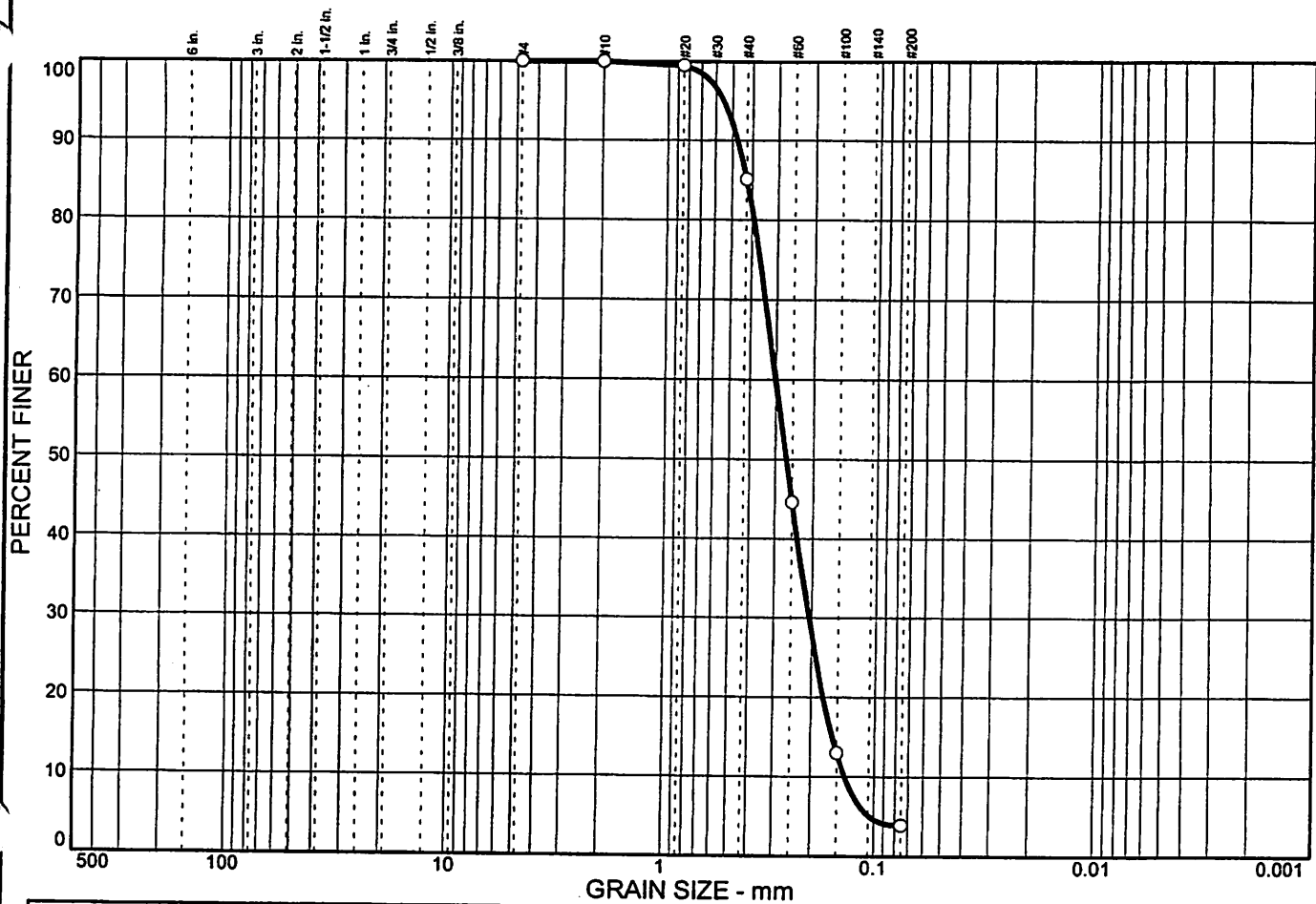


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	96.1	3.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.5		
#40	85.1		
#60	44.6		
#100	13.0		
#200	3.9		

* (no specification provided)

Soil Description

Light brown sand trace silt
Moisture=8.0%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.424 D₆₀= 0.301 D₅₀= 0.267
D₃₀= 0.205 D₁₅= 0.157 D₁₀= 0.137
C_u= 2.19 C_c= 1.02

Classification

USCS= SP AASHTO=

Remarks

Tested by: SS/YY Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.7
Location: TP-108, S-1

Source of Sample:

Date: 2/06/02
Elev./Depth: 4'

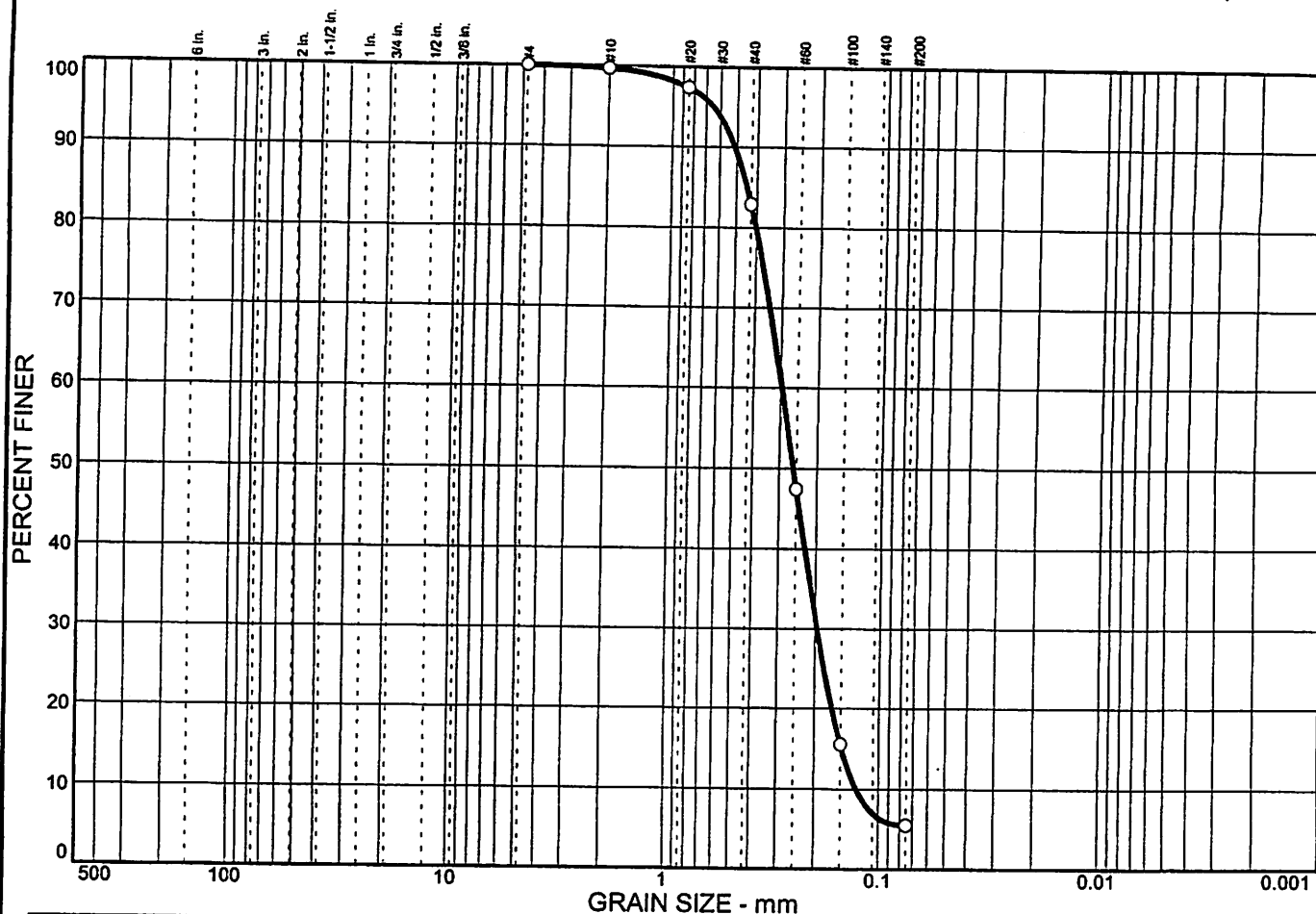


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	94.5	5.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	97.4		
#40	82.9		
#60	47.4		
#100	15.5		
#200	5.5		

* (no specification provided)

Soil Description

Reddish brown sand some silt
Moisture=11.3%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.445 D₆₀= 0.296 D₅₀= 0.259
D₃₀= 0.196 D₁₅= 0.148 D₁₀= 0.127
C_u= 2.34 C_c= 1.02

Classification

USCS= SP-SM AASHTO=

Remarks

Tested by: SS/JW Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.8
Location: TP-110, S-1

Source of Sample:

Date: 2/07/02
Elev./Depth: 1'

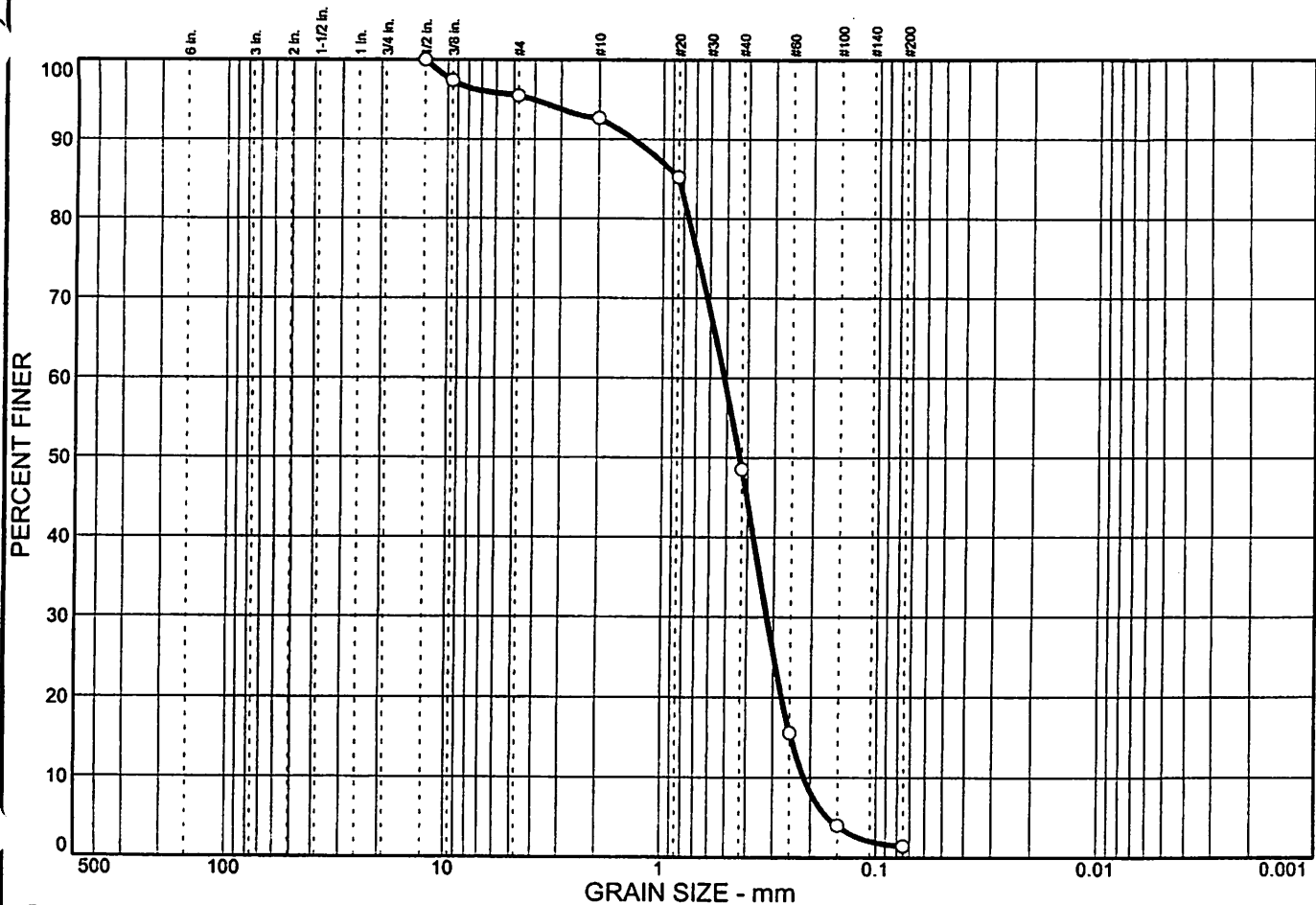


Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.5	94.1	1.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	97.4		
#4	95.5		
#10	92.7		
#20	85.2		
#40	48.5		
#60	15.6		
#100	4.0		
#200	1.4		

* (no specification provided)

Soil Description

Sand trace gravel
Moisture=5.6%

Atterberg Limits

PL= LL= PI=

Coefficients

D₈₅= 0.846 D₆₀= 0.514 D₅₀= 0.435
D₃₀= 0.322 D₁₅= 0.247 D₁₀= 0.214
C_u= 2.40 C_c= 0.94

Classification

USCS= SP AASHTO=

Remarks

Tested by: SS/JW Reviewed by: ML
ASTM: C136-96a, D1140-97, D2216-96
Sampled: 1/31/02

Sample No.: 4868.9
Location: TP-112, S-1

Source of Sample:

Date: 2/07/02
Elev./Depth: 8'



Client: Parametrix
Project: Dewatering Infiltration Project, Tulalip

Project No: 2-91M-13845-B

Plate

APPENDIX C

PUMP TEST RESULTS

Pumping Test P-1
(Pumping rate = 1.2 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	8.62
5	0.08	
10	0.17	8.88
15	0.25	8.92
20	0.33	8.94
25	0.42	
30	0.50	8.96
35	0.58	8.98
40	0.67	8.99
45	0.75	
50	0.83	9.03
55	0.92	
60	1.00	9.05
75	1.25	9.07
90	1.50	9.09
105	1.75	9.1
120	2.00	9.12
135	2.25	9.12
150	2.50	9.13
165	2.75	9.14
180	3.00	9.15
210	3.50	9.15
240	4.00	9.16
270	4.50	9.17
300	5.00	9.17
360	6.00	9.18
420	7.00	9.185
480	8.00	9.19
540	9.00	9.2
600	10.00	9.2
660	11.00	9.2
720	12.00	9.205
780	13.00	9.205
840	14.00	9.21
900	15.00	9.21

Total Drawdown (feet) **0.59**

* All measurements taken from the top of the monument

Recovery Test P-1

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	9.21
5	0.08	8.91
10	0.17	8.87
15	0.25	8.75
20	0.33	8.66
25	0.42	8.6
30	0.50	8.56
35	0.58	8.52
40	0.67	
45	0.75	
50	0.83	8.64
55	0.92	8.65
60	1.00	8.66
75	1.25	8.67
90	1.50	8.67
105	1.75	8.67
120	2.00	8.67
135	2.25	8.67
150	2.50	8.67
165	2.75	8.67
180	3.00	8.66
210	3.50	8.66
240	4.00	8.655
270	4.50	8.65
300	5.00	8.65

Pumping Test P-2
(Pumping rate = 1.1 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	11.72
5	0.08	11.98
10	0.17	
15	0.25	12.05
20	0.33	
25	0.42	12.16
30	0.50	12.2
35	0.58	
40	0.67	
45	0.75	12.27
50	0.83	
55	0.92	
60	1.00	12.32
75	1.25	
90	1.50	12.41
105	1.75	
120	2.00	12.47
135	2.25	
150	2.50	12.51
165	2.75	
180	3.00	12.55
210	3.50	12.58
240	4.00	12.6
270	4.50	
300	5.00	12.63
360	6.00	12.66
420	7.00	12.68
480	8.00	12.69
540	9.00	12.71
600	10.00	12.71
660	11.00	12.72
720	12.00	12.74
780	13.00	12.76
840	14.00	12.76
900	15.00	12.77

Total Drawdown (feet) **1.05**

* All measurements taken from the top of the monument

Recovery Test P-2

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	12.77
5	0.08	
10	0.17	12.46
15	0.25	12.35
20	0.33	12.25
25	0.42	
30	0.50	12.7
35	0.58	
40	0.67	
45	0.75	11.86
50	0.83	
55	0.92	
60	1.00	11.89
75	1.25	
90	1.50	11.89
105	1.75	
120	2.00	11.88
135	2.25	
150	2.50	11.86
165	2.75	
180	3.00	11.85
210	3.50	11.85
240	4.00	11.84
270	4.50	11.83
300	5.00	11.82

Pumping Test P-3
(Pumping rate = 2.7 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	5.48
5	0.08	
10	0.17	7.4
15	0.25	7.85
20	0.33	8
25	0.42	8.11
30	0.50	8.21
35	0.58	8.29
40	0.67	8.31
45	0.75	8.42
50	0.83	8.47
55	0.92	8.5
60	1.00	8.53
75	1.25	8.61
90	1.50	8.65
105	1.75	8.69
120	2.00	8.71
135	2.25	8.71
150	2.50	8.71
165	2.75	8.715
180	3.00	8.73
210	3.50	8.75
240	4.00	8.76
270	4.50	8.77
300	5.00	8.78
360	6.00	8.79
420	7.00	8.8
480	8.00	8.81
540	9.00	8.82
600	10.00	8.82
660	11.00	8.82
720	12.00	8.82
780	13.00	8.83
840	14.00	8.85
900	15.00	8.86

Total Drawdown (feet) **3.38**

* All measurements taken from the top of the monument

Recovery Test P-3

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	8.86
5	0.08	8.2
10	0.17	6.81
15	0.25	5.92
20	0.33	5.4
25	0.42	5.27
30	0.50	5.24
35	0.58	5.22
40	0.67	5.22
45	0.75	5
50	0.83	5
55	0.92	5.38
60	1.00	5.38
75	1.25	5.45
90	1.50	5.49
105	1.75	5.49
120	2.00	5.49
135	2.25	5.49
150	2.50	5.49
165	2.75	5.48
180	3.00	5.48
210	3.50	5.48
240	4.00	5.48
270	4.50	5.48
300	5.00	5.48

Pumping Test P-4
(Pumping rate = 2.6 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	7.44
5	0.08	8.6
10	0.17	
15	0.25	8.94
20	0.33	9.12
25	0.42	9.21
30	0.50	9.29
35	0.58	9.34
40	0.67	9.4
45	0.75	9.44
50	0.83	
55	0.92	9.49
60	1.00	9.51
75	1.25	9.55
90	1.50	9.6
105	1.75	9.64
120	2.00	9.67
135	2.25	9.69
150	2.50	9.7
165	2.75	9.72
180	3.00	9.73
210	3.50	9.74
240	4.00	9.76
270	4.50	9.77
300	5.00	9.79
360	6.00	9.8
420	7.00	9.81
480	8.00	9.81
540	9.00	9.815
600	10.00	9.82
660	11.00	9.825
720	12.00	9.83
780	13.00	9.83
840	14.00	9.83
900	15.00	9.83

Total Drawdown (feet) 2.39

* All measurements taken from the top of the monument

Recovery Test P-4

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	9.83
5	0.08	9.1
10	0.17	8.3
15	0.25	7.92
20	0.33	7.61
25	0.42	7.51
30	0.50	
35	0.58	7.44
40	0.67	7.36
45	0.75	
50	0.83	
55	0.92	
60	1.00	7.53
75	1.25	7.64
90	1.50	7.64
105	1.75	7.63
120	2.00	7.62
135	2.25	7.61
150	2.50	7.6
165	2.75	7.58
180	3.00	7.56
210	3.50	7.56
240	4.00	7.55
270	4.50	7.54
300	5.00	7.53

Pumping Test P-5
(Pumping rate = 3.8 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	5.08
5	0.08	
10	0.17	6.35
15	0.25	6.35
20	0.33	6.36
25	0.42	6.36
30	0.50	6.36
35	0.58	6.37
40	0.67	6.38
45	0.75	6.38
50	0.83	6.39
55	0.92	6.39
60	1.00	6.39
75	1.25	6.39
90	1.50	6.39
105	1.75	6.4
120	2.00	6.41
135	2.25	6.41
150	2.50	6.41
165	2.75	6.42
180	3.00	6.42
210	3.50	6.42
240	4.00	6.43
270	4.50	6.43
300	5.00	6.44
360	6.00	6.44
420	7.00	6.44
480	8.00	6.44
540	9.00	6.44
600	10.00	6.44
660	11.00	6.445
720	12.00	6.445
780	13.00	6.445
840	14.00	6.445
900	15.00	6.445

Total Drawdown (feet) 1.365

* All measurements taken from the top of the monument

Recovery Test P-5

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	6.445
5	0.08	5.75
10	0.17	5.22
15	0.25	5.1
20	0.33	5.05
25	0.42	5
30	0.50	4.99
35	0.58	4.99
40	0.67	4.99
45	0.75	5
50	0.83	5.05
55	0.92	5.06
60	1.00	5.07
75	1.25	5.12
90	1.50	5.13
105	1.75	5.13
120	2.00	5.13
135	2.25	5.13
150	2.50	5.13
165	2.75	5.13
180	3.00	5.125
210	3.50	5.12
240	4.00	5.12
270	4.50	5.12
300	5.00	5.12

Pumping Test P-6
(Pumping rate = 5.5 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	2.6
5	0.08	
10	0.17	2.9
15	0.25	4.55
20	0.33	5.15
25	0.42	5.25
30	0.50	5.7
35	0.58	5.95
40	0.67	6.05
45	0.75	6.1
50	0.83	
55	0.92	6.17
60	1.00	6.22
75	1.25	6.3
90	1.50	6.4
105	1.75	6.43
120	2.00	6.47
135	2.25	
150	2.50	6.56
165	2.75	
180	3.00	6.62
210	3.50	6.67
240	4.00	6.73
270	4.50	6.76
300	5.00	6.8
360	6.00	6.88
420	7.00	6.93
480	8.00	6.98
540	9.00	7.02
600	10.00	7.06
660	11.00	7.08
720	12.00	7.12
780	13.00	7.14
840	14.00	7.17
900	15.00	7.18

Total Drawdown (feet) **4.58**

* All measurements taken from the top of the monument

Recovery Test P-6

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	7.18
5	0.08	
10	0.17	4.85
15	0.25	4.25
20	0.33	
25	0.42	4.1
30	0.50	4.02
35	0.58	3.9
40	0.67	3.86
45	0.75	
50	0.83	3.8
55	0.92	3.76
60	1.00	3.74
75	1.25	3.67
90	1.50	3.61
105	1.75	3.56
120	2.00	3.52
135	2.25	3.48
150	2.50	3.45
165	2.75	3.42
180	3.00	3.41
210	3.50	3.35
240	4.00	3.32
270	4.50	3.28
300	5.00	3.25

Pumping Test P-7
(Pumping rate = 5.5 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	3.19
5	0.08	
10	0.17	5.8
15	0.25	6.2
20	0.33	6.6
25	0.42	6.85
30	0.50	7
35	0.58	7.03
40	0.67	7.12
45	0.75	7.17
50	0.83	7.2
55	0.92	7.22
60	1.00	7.25
75	1.25	7.32
90	1.50	7.37
105	1.75	7.41
120	2.00	7.44
135	2.25	7.47
150	2.50	7.5
165	2.75	7.51
180	3.00	7.53
210	3.50	7.56
240	4.00	7.58
270	4.50	7.6
300	5.00	7.63
360	6.00	7.66
420	7.00	7.7
480	8.00	7.72
540	9.00	7.75
600	10.00	7.76
660	11.00	7.78
720	12.00	7.8
780	13.00	7.81
840	14.00	7.81
900	15.00	7.81

Total Drawdown (feet) **4.62**

* All measurements taken from the top of the monument

Recovery Test P-7

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	7.81
5	0.08	
10	0.17	5
15	0.25	4.6
20	0.33	4.12
25	0.42	3.9
30	0.50	3.8
35	0.58	3.75
40	0.67	3.69
45	0.75	3.65
50	0.83	3.61
55	0.92	
60	1.00	3.58
75	1.25	3.54
90	1.50	3.53
105	1.75	3.51
120	2.00	3.49
135	2.25	3.47
150	2.50	3.46
165	2.75	3.45
180	3.00	3.44
210	3.50	3.42
240	4.00	3.41
270	4.50	3.4
300	5.00	3.39

Pumping Test P-8
(Pumping rate = 5.5 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	2.14
5	0.08	2.75
10	0.17	2.85
15	0.25	3.3
20	0.33	
25	0.42	3.55
30	0.50	
35	0.58	3.9
40	0.67	4.03
45	0.75	4.07
50	0.83	4.09
55	0.92	4.11
60	1.00	4.13
75	1.25	4.15
90	1.50	4.17
105	1.75	4.2
120	2.00	4.22
135	2.25	4.23
150	2.50	4.25
165	2.75	4.26
180	3.00	4.26
210	3.50	4.29
240	4.00	4.3
270	4.50	4.32
300	5.00	4.34
360	6.00	4.35
420	7.00	4.37
480	8.00	4.39
540	9.00	4.4
600	10.00	4.41
660	11.00	4.43
720	12.00	4.44
780	13.00	4.44
840	14.00	4.45
900	15.00	4.45

Total Drawdown (feet) **2.31**

* All measurements taken from the top of the monument

Recovery Test P-8

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	4.45
5	0.08	3.1
10	0.17	
15	0.25	2.55
20	0.33	2.45
25	0.42	2.45
30	0.50	2.45
35	0.58	2.45
40	0.67	2.45
45	0.75	2.42
50	0.83	2.41
55	0.92	2.41
60	1.00	2.4
75	1.25	2.39
90	1.50	2.37
105	1.75	2.36
120	2.00	2.35
135	2.25	2.33
150	2.50	2.32
165	2.75	2.31
180	3.00	2.305
210	3.50	2.29
240	4.00	2.28
270	4.50	2.27
300	5.00	2.27

Pumping Test P-9
(Pumping rate = 5.5 gpm)

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	5.32
5	0.08	
10	0.17	
15	0.25	6.8
20	0.33	7.55
25	0.42	7.72
30	0.50	7.75
35	0.58	7.78
40	0.67	7.8
45	0.75	7.82
50	0.83	7.83
55	0.92	7.85
60	1.00	7.86
75	1.25	7.87
90	1.50	7.91
105	1.75	7.93
120	2.00	7.94
135	2.25	7.96
150	2.50	7.97
165	2.75	7.98
180	3.00	7.99
210	3.50	8.01
240	4.00	8.02
270	4.50	8.02
300	5.00	8.025
360	6.00	8.03
420	7.00	8.05
480	8.00	8.06
540	9.00	8.08
600	10.00	8.1
660	11.00	8.1
720	12.00	8.1
780	13.00	8.1
840	14.00	8.1
900	15.00	8.1

Total Drawdown (feet) **2.78**

* All measurements taken from the top of the monument

Recovery Test P-9

Time (sec)	Time (min)	Depth to water (feet)*
0	0.00	8.1
5	0.08	6.6
10	0.17	6.15
15	0.25	5.77
20	0.33	5.65
25	0.42	5.58
30	0.50	5.54
35	0.58	5.51
40	0.67	5.49
45	0.75	5.47
50	0.83	5.46
55	0.92	5.45
60	1.00	5.44
75	1.25	5.42
90	1.50	5.41
105	1.75	5.4
120	2.00	5.39
135	2.25	5.39
150	2.50	5.385
165	2.75	5.38
180	3.00	5.38
210	3.50	5.37
240	4.00	5.37
270	4.50	5.36
300	5.00	5.36